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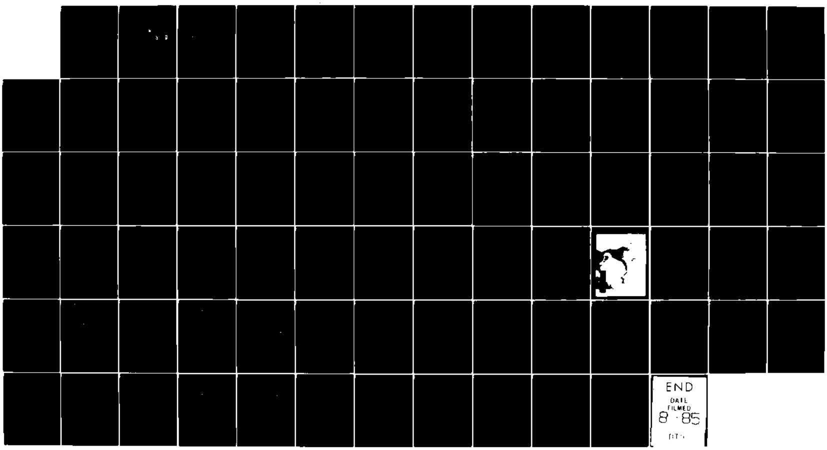

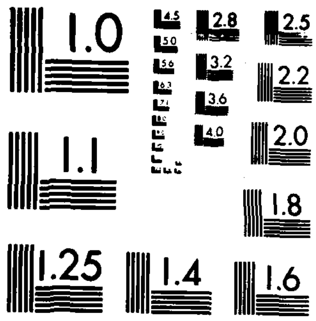

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METEOROLOGICAL DATA FROM THE OPTOMA PROGRAM
OPTOMA11, Leg DII
30 June - 10 July, 1984

by

Marie C. Colton
Christopher N.K. Mooers

May 1985

Approved for public release; distribution unlimited.

Prepared for:
Office of Naval Research
Environmental Sciences Directorate (Code 420)
Arlington, VA 22217

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the meteorological data acquired by twenty-six radiosondes launched during the hydrographic cruise OPTOMA11, Leg DII (30 June to 10 July, 1984). To compare the prevailing atmospheric and oceanic conditions the radiosonde potential temperature and specific humidity profiles are plotted with nearly coincident XBT temperature profiles. Also included are: 1) time series plots of hourly dry-bulb and wet-bulb temperatures and hourly wind velocities, 2) an AVHRR image, and 3) National Weather Service surface pressure analyses for the cruise period.

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Meteorological Data from the **OPTOMA** *Program:*

OPTOMA11 Leg DII
30 June - 10 July, 1984

by

Marie C. Colton
Christopher N. K. Mooers

Chief Scientist:
C. N. K. Mooers

The **OPTOMA** Program is a joint program of

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Harvard University
Cambridge, MA 02138.

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INTRODUCTION

The OPTOMA (Ocean Prediction Through Observations, Modeling and Analysis) Program, a joint NPS/Harvard program sponsored by ONR, seeks to understand the mesoscale (front, eddies, and jets) variability and dynamics of the California Current System and to determine the scientific limits to practical mesoscale ocean forecasting. To help carry out the aims of this project, a series of cruises and flights has been planned in two subdomains, NOCAL and CENCAL, shown in Figure 1. This report summarizes the meteorological data acquired during OPTOMA11, cruise Leg DII (described below), especially the atmospheric profiles from radiosondes which were recorded using a new AIR, Inc. data acquisition system.

The six cruises and one AXBT flight comprising OPTOMA11 were undertaken, during June, July, and August 1984, in the R/V ACANIA (Legs AI, AII, AIII), the USNS DE STEIGUER (Legs DI, DII, DIII) and a Navy Reserve Patrol Wing P3A aircraft (Leg P). Hydrographic data were acquired off the coast of California in an area which covered and extended the NOCAL region. The sampling was concentrated in a central 150 km square domain centered about 190 km off the coast between Pt. Reyes and Pt. Arena in the NOCAL domain.

Leg AI was carried out from 5 to 15 June, Leg AII from 21 June to 30 June and Leg AIII from 5 to 13 July. These three legs sampled the central domain with additional transects to and from the domain. Leg DI was carried out from 23 to 30 June, Leg DII from 30 June to 10 July, and DIII from 27 July to 5 August. Leg DI sampled areas to the north, south and inshore of the central domain. Leg DII sampled the central domain area with additional legs to the west and south of the area, as shown in Figure 2. Leg DIII,

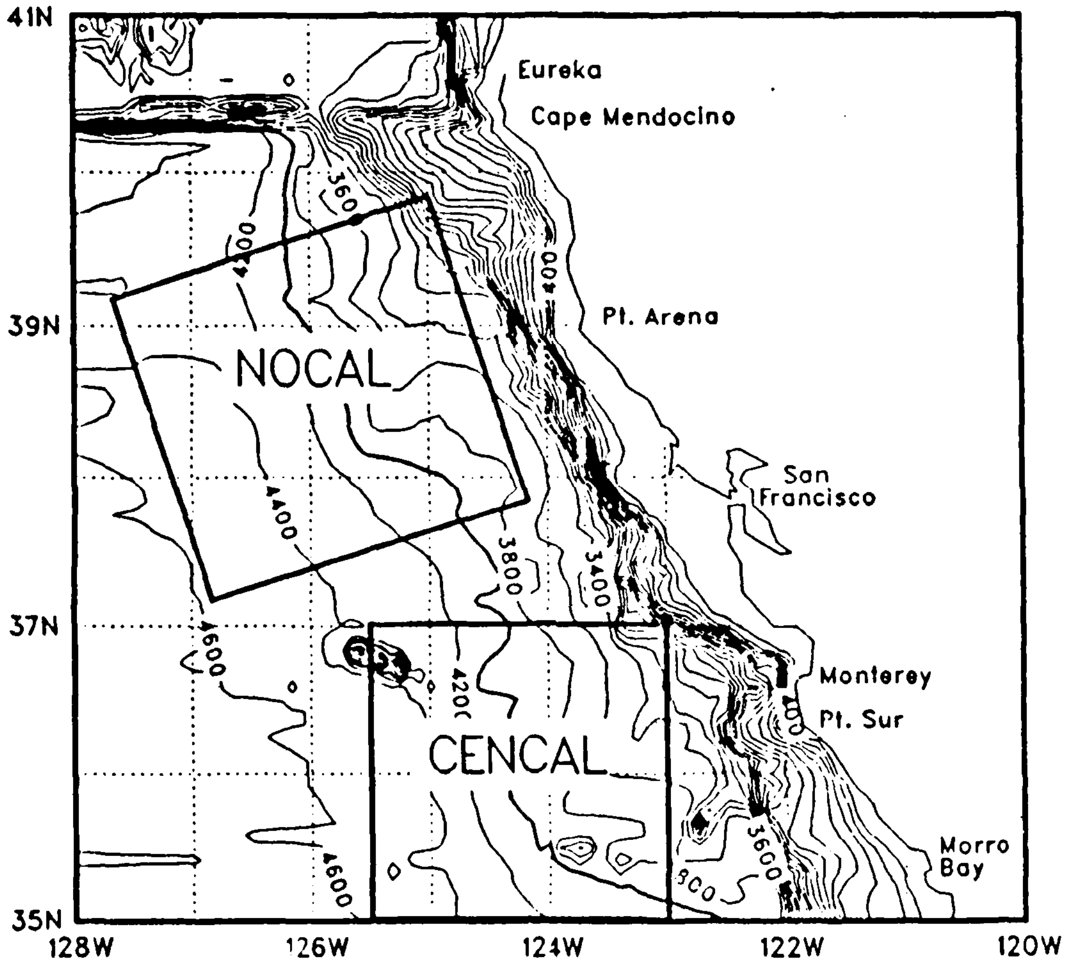


Figure 1: The NOCAL and CENCAL subdomains of the OPTOMA Program. Isobaths are shown in meters.

AIRSONDE SPECIFICATIONS *MODELS AS-1AT, AS-1A-TH, AS-1B-P.T, AS-1C-PTH*

The following performance specifications are for the sondes when used with an AIR ground station in a field environment. It includes all sources of error for digital non baselined data.

SENSORS

Temperature (Wet and Dry Bulb)

Range:	+ 50° C to − 70° C
Precision:	0.5° C for + 40° C to − 40° C (Typical temperature accuracy is 0.2° C over this range.) 1.0° C for + 50° C to − 70° C
Thermistor Match:	0.1° C for + 35° C to − 20° C
Resolution:	0.01° C
Total System RMS Noise Noise Equivalent:	0.04° C (includes random telemetric and computational errors.)
Response Time:	Dry Bulb 3 sec Wet Bulb 12 sec

Humidity (From psychrometic equation)

Range:	3% to 100%
Precision:	3% for 0° C to 50° C (Typical humidity accuracy is 2% RH over this temperature range.) 5% for − 10° C to 0° C 10% for − 25° C to − 10° C

Pressure (Absolute Barometric)

Range:	1050 to 250 mb
Precision:	3 mb
Resolution:	0.1 mb
Temperature Compensation:	Bead thermistor with automatic correction computed by AIR ground station

TRANSMITTER

Carrier Frequency:	403.5 Mhz (std) 400-410 Mhz (Optional)
Modulation:	FM, narrow band
Audio Modulation:	1.5Khz to 3.5Khz
Transmitter Type:	Crystal VCXO with 9x multiplication
Stability:	0.02% (+ 50° C to − 70° C)
Deviation:	± 5 Khz
Tuning:	None, fixed by crystal
Transmitter Power:	25 milliwatts
Telemetry Range:	100 km (nominal)
Antenna:	¼ wave vertical monopole
RF Polarization:	linear, vertical

Table I : Specifications and sensor accuracies of the AIR, Inc. radiosonde system.

with an intensive sampling pattern which differed from the previous cruises, covered the central and inshore domains. On each of these cruises, hydrographic stations were occupied at approximately 15 km along the track. Leg P was carried out on 18 July aboard an USNR P3A aircraft, and sampled at 35 km intervals an area approximately 250 km square in the NOCAL area. The hydrographic data from all of the above cruises and the flight have been reported in Wittmann, et. al. (1985).

The cruise OPTOMA11, Leg DII differed from all the other OPTOMA11 cruises in that atmospheric conditions were sampled by radiosondes, in addition to the sampling of oceanic conditions by XBTs and CTDs. In this report, the data from the twenty-six radiosondes which comprise the data set are presented. Supplementary meteorological information consisting of hourly dry and wet bulb temperatures, hourly wind velocity, and surface pressure analyses are also included.

DATA ACQUISITION

The radiosondes deployed in this study (AIR Inc., Model AS-1C-PTH) measured pressure, dry-bulb and wet-bulb temperatures. The telemetered data were received and processed using an AIR, Inc. Model AIR-3 ground station. The processed data were then transferred to an OTRONA microprocessor via an IEEE-488 interface bus, and were stored on diskettes. The specifications and accuracies of the radiosonde sensors are shown in Table I.

Relative wind speed and direction readings from the ship's anemometer were logged hourly, after conversion to true wind speed and direction by adjustment for the ship's speed and heading. Dry-bulb and wet-bulb temperatures obtained from a sling psychrometer were also logged hourly.

The XBT profiles shown in Figures 8 (a)-(l) were obtained from Sippican T-4 (450m) and T-7 (750m) XBTs and were digitized using a Sippican MK9 unit. The temperature accuracy of these XBTs is 0.2C and the depth accuracy is 4.6 m or 2% of the depth, whichever is greater.

DATA PROCESSING

The initial editing of the radiosonde data (such as removal of obvious temperature spikes) was performed by Mr. Robert Sylvia at the Coastal Studies Institute, Louisiana State University. The data were then copied to diskettes and sent to NPS, where they were transferred to the IBM3033 for further processing (e.g., deletion of erroneous points, and truncation of some profiles). Of the 28 radiosondes launched, there were two failures which were removed from the data set, resulting in a retention percentage of approximately 93%.

The data have been transferred on digital tape to the National Oceanographic Data Center in Washington, DC.

DATA PRESENTATION

The OPTOMA11, Leg DII cruise track, radiosonde station positions and station numbers are shown in Figures 2, 3, and 4, respectively. These figures are followed by Table II containing a listing of the radiosonde stations, with their coordinates, the date and time at which each station was occupied, and the surface information obtained at the station. To relate the radiosonde stations to the hydrographic stations, the XBT/CTD positions are shown in Figure 5, and the XBT/CTD station information is listed in Table III.

Vertical profiles of potential temperature and specific humidity to 3000m from

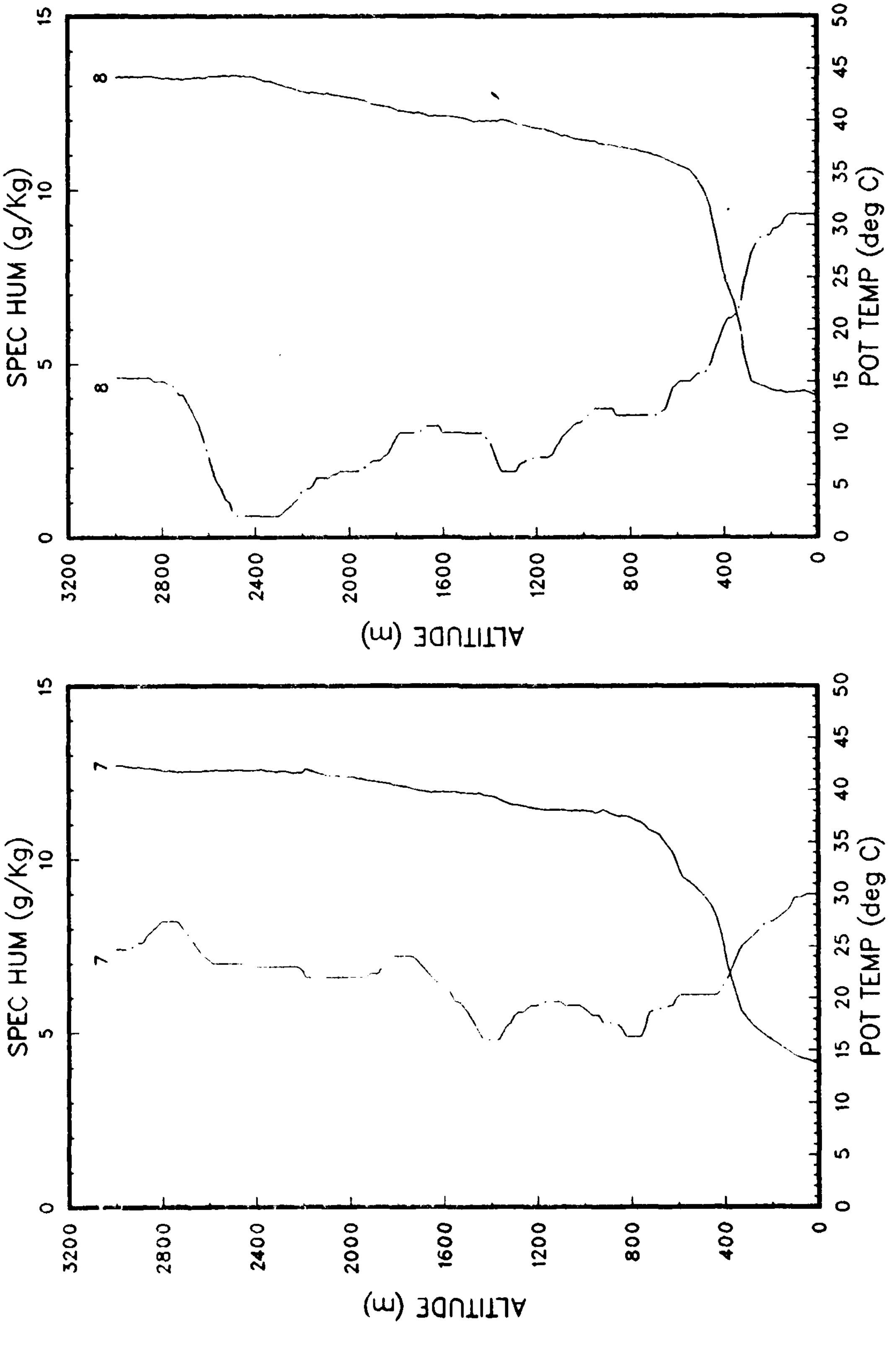


Figure 6(d).

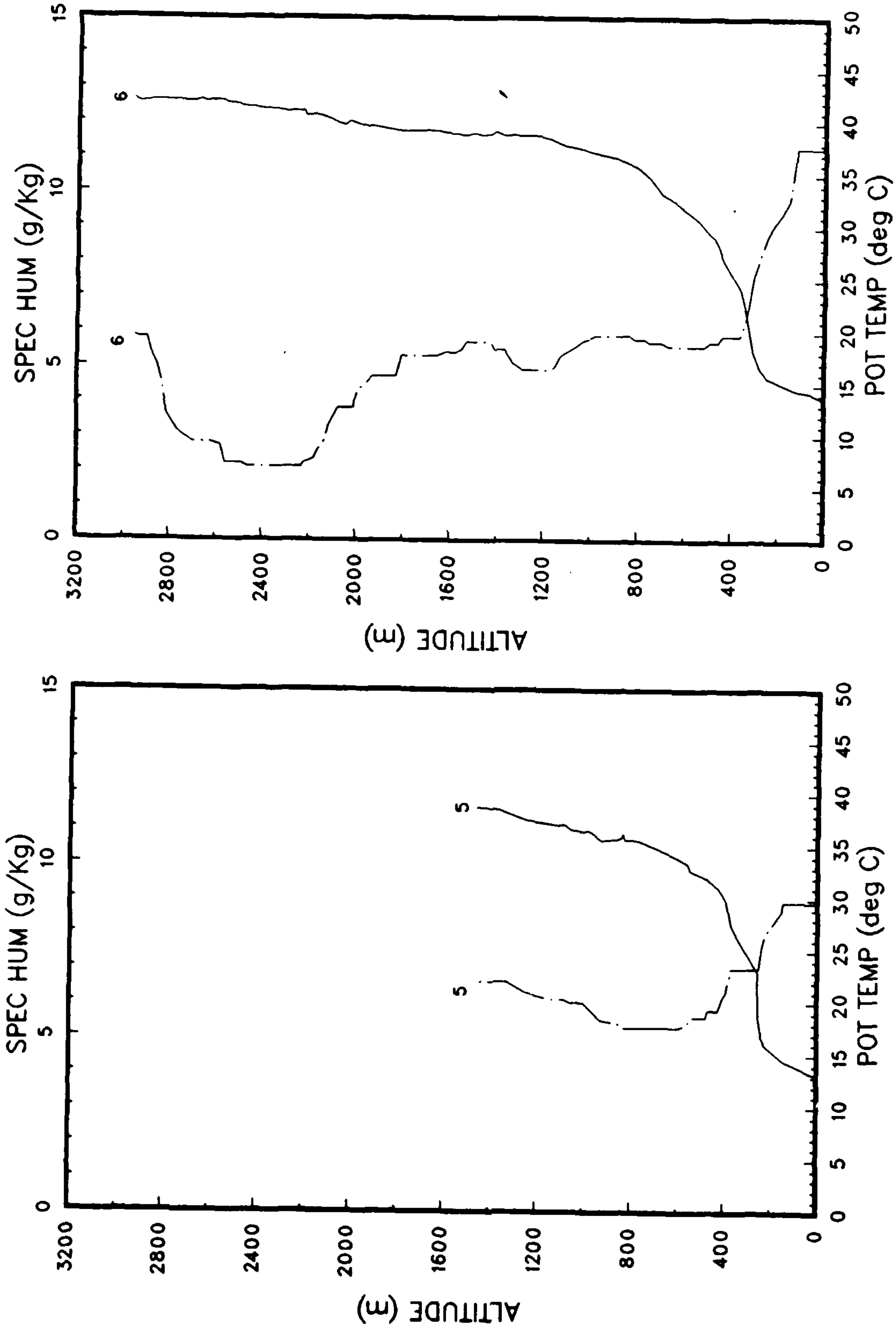


Figure 6(c).

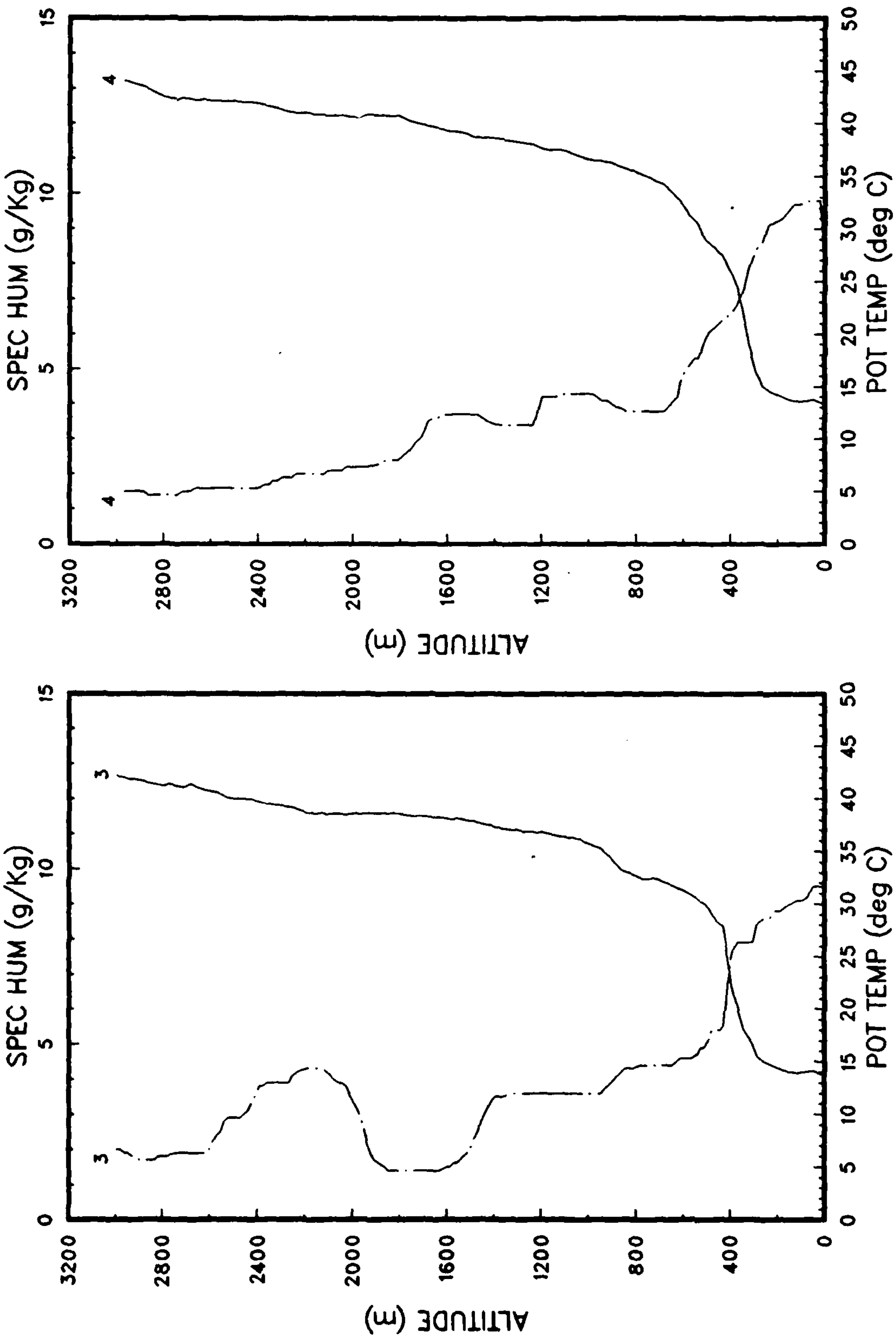

SPEC HUM (g/Kg)
POT TEMP (deg C)
ALTITUDE (m)
SPEC HUM (g/Kg)
POT TEMP (deg C)
ALTITUDE (m)

Figure 6(b).

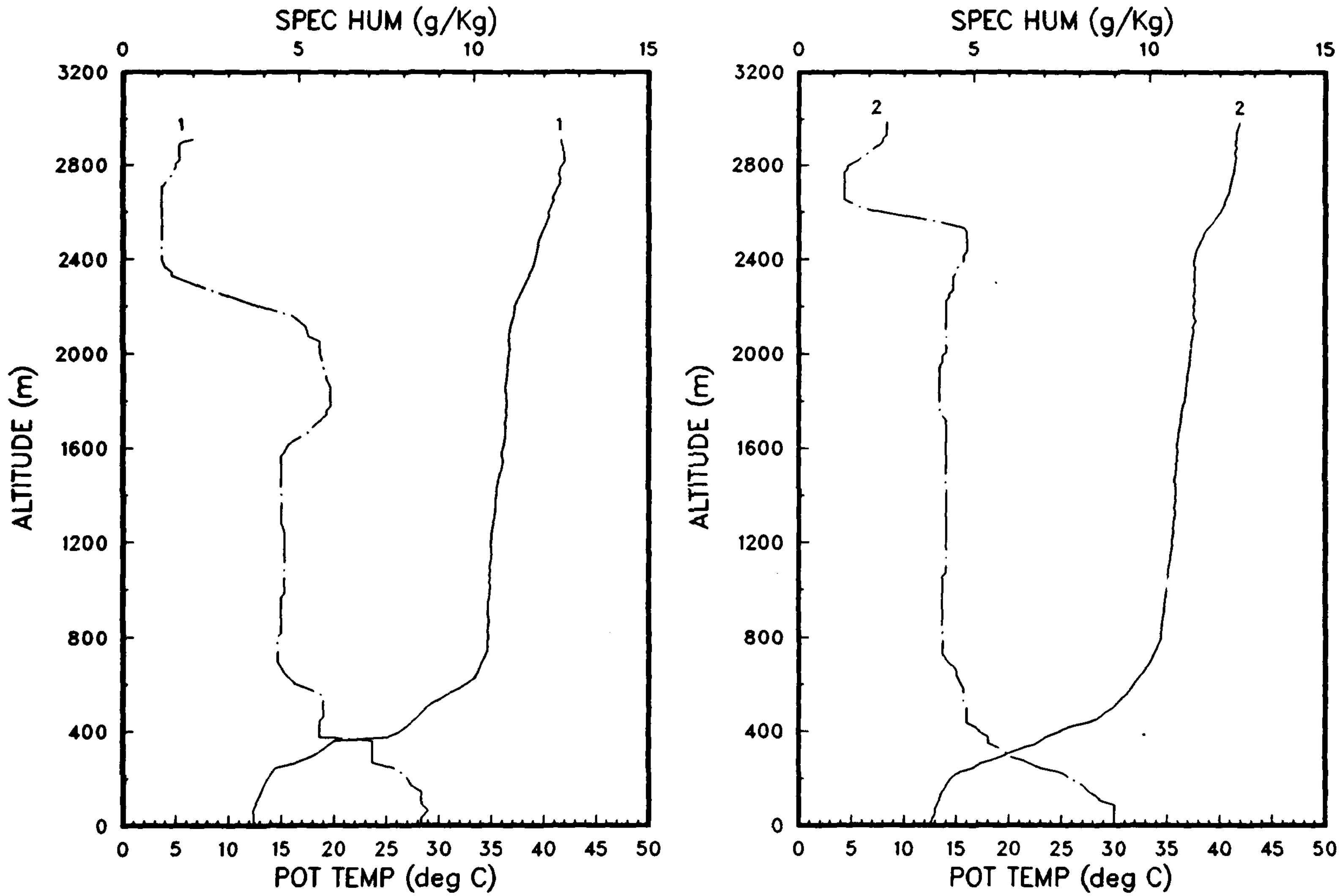


Figure 6(a): Potential temperature (———) and specific humidity (—·—) profiles to 3000m from the radiosondes. The potential temperature is shown in degrees Celsius (OPTOMA11, Leg DII).

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
136	XBT	84191	55	36.52	122.09	14.2			
137	XBT	84191	202	37.00	122.19	13.4			
138	CTD	84190	247	37.02	122.23	12.5	33.70	12.8	33.47
139	XBT	84191	440	37.04	122.41	12.8			
140	XBT	84191	607	37.05	122.57	14.0			
141	CTD	84191	814	37.09	123.15	14.2	33.25	14.3	33.26
142	CTD	84191	1314	37.21	123.16	12.5	33.52	*	*
143	XBT	84191	1921	37.33	123.18	12.8			
144	XBT	84191	2239	37.47	123.23	12.4			
145	XBT	84192	122	37.59	123.21	11.7			
146	CTD	84192	318	38.08	123.21	10.6	33.73	10.2	33.75
147	CTD	84192	411	38.03	123.15	12.7	33.60	10.8	33.38
148	XBT	84192	538	37.56	123.08	11.9			
149	CTD	84192	710	37.48	123.00	11.8	33.70	12.0	*

* Data not available

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
91	CTD	84187	2139	37.24	126.24	13.9	33.37	14.0	*
92	XBT	84187	2344	37.21	126.10	14.2			
93	XBT	84188	36	37.20	126.00	14.0			
94	CTD	84188	144	37.19	125.46	14.0	33.39	*	*
95	XBT	84188	402	37.12	126.00	14.1			
96	XBT	84188	502	37.07	126.09	14.5			
97	XBT	84188	556	37.03	126.19	15.0			
98	CTD	84188	721	36.59	126.33	15.4	32.91	15.3	32.94
99	XBT	84188	944	36.42	126.21	15.7			
100	XBT	84188	1044	36.32	126.15	15.5			
101	CTD	84188	1134	36.24	126.13	15.5	32.88	15.4	33.33
102	XBT	84188	1328	36.17	126.06	15.5			
103	XBT	84188	1410	36.10	126.01	15.4			
104	CTD	84188	1510	36.00	125.55	15.6	32.90	15.9	32.76
105	XBT	84188	1744	36.08	125.50	15.4			
106	XBT	84188	2025	36.17	125.44	15.6			
107	XBT	84188	2308	36.29	125.39	15.5			
108	CTD	84189	100	36.39	125.34	15.5	32.88	15.8	32.91
109	XBT	84189	346	36.49	125.27	14.5			
110	XBT	84189	531	36.57	125.22	14.3			
111	CTD	84189	752	37.05	125.17	12.8	32.91	12.7	32.91
112	XBT	84189	1056	37.13	125.13	13.4			
113	CTD	84189	1300	37.20	125.11	12.8	33.25	13.0	33.28
114	XBT	84189	1436	37.12	124.59	13.1			
115	XBT	84189	1543	37.04	124.48	13.9			
116	XBT	84189	1649	36.56	124.39	14.2			
117	XBT	84189	1755	36.50	124.31	13.1			
118	CTD	84189	1919	36.39	124.16	13.4	32.97	13.7	32.98
119	XBT	84189	2136	36.51	12[illegible].12	14.1			
120	XBT	84189	2342	37.00	124.05	14.0			
121	XBT	84190	110	37.09	124.01	13.9			
122	CTD	84190	300	37.20	123.58	13.3	33.43	13.0	33.28
123	XBT	84190	440	37.10	123.53	14.4			
124	XBT	84190	534	37.01	123.49	13.9			
125	XBT	84190	634	36.49	123.45	14.7			
126	XBT	84190	731	36.41	123.40	14.6			
127	XBT	84190	923	36.50	123.34	14.7			
128	XBT	84190	1057	37.00	123.30	14.7			
129	XBT	84190	555	37.09	123.24	14.2			
130	XBT	84190	1400	37.05	123.13	14.0			
131	CTD	84190	1510	37.00	123.01	14.4	33.21	14.3	33.23
132	XBT	84190	1719	36.56	122.48	14.0			
133	XBT	84190	1814	36.52	122.37	13.3			
134	XBT	84190	1932	36.47	122.21	13.9			
135	XBT	84190	2014	36.45	122.12	14.1			

* Data not available

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
46	XBT	84185	2158	38.14	125.54	14.2			
47	XBT	84185	2302	38.18	126.06	14.7			
48	XBT	84186	6	38.22	126.23	14.6			
49	XBT	84186	102	38.25	126.28	14.6			
50	CTD	84186	134	38.28	126.37	14.4	32.66	14.8	32.69
51	XBT	84186	248	38.31	126.32	14.5			
52	XBT	84186	426	38.38	126.15	14.9			
53	XBT	84186	514	38.43	126.05	14.7			
54	XBT	84186	619	38.49	125.54	15.1			
55	XBT	84186	739	38.55	125.42	15.1			
56	XBT	84186	850	39.00	125.31	14.7			
57	XBT	84186	930	39.03	125.20	14.5			
58	CTD	84186	1122	39.09	125.11	14.5	32.56	14.6	32.59
59	XBT	84186	1226	39.02	125.10	14.3			
60	XBT	84186	1336	38.48	125.17	14.2			
61	XBT	84186	1434	38.38	125.20	14.4			
62	XBT	84186	1534	38.28	125.24	14.2			
63	XBT	84186	1627	38.19	125.24	14.5			
64	CTD	84186	1716	38.09	125.32	14.3	32.64	14.9	*
65	XBT	84186	1910	38.13	125.46	14.1			
66	XBT	84186	2000	38.15	125.56	14.8			
67	XBT	84186	2055	38.19	126.12	14.8			
68	XBT	84186	2135	38.21	126.17	14.7			
69	XBT	84186	2230	38.25	126.28	14.9			
70	CTD	84186	2311	38.28	126.37	14.8	32.67	15.2	32.70
71	XBT	84187	44	38.25	126.49	14.9			
72	XBT	84187	138	38.18	126.58	14.6			
73	XBT	84187	221	38.14	127.02	14.7			
74	XBT	84187	319	38.13	126.50	14.5			
75	XBT	84187	430	38.10	126.35	14.4			
76	XBT	84187	517	38.08	126.23	14.4			
77	XBT	84187	621	38.05	126.30	14.1			
78	XBT	84187	722	38.01	126.43	13.9			
79	CTD	84187	800	38.00	126.50	14.1	32.63	14.4	32.64
80	XBT	84187	1021	37.55	126.38	13.4			
81	XBT	84187	1134	37.53	126.24	13.0			
82	XBT	84187	1300	37.52	126.12	14.0			
83	XBT	84187	1346	37.48	126.20	13.4			
84	XBT	84187	1427	37.44	126.29	11.9			
85	CTD	84187	1526	37.40	126.37	12.1	32.73	13.3	32.67
86	XBT	84187	1733	37.38	126.21	12.1			
87	XBT	84187	1816	37.38	126.11	11.9			
88	XBT	84187	1933	37.35	126.00	12.5			
89	XBT	84187	2013	37.32	126.08	12.3			
90	XBT	84187	2058	37.28	126.15	13.8			

* Data not available

Table III:Leg DII Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE TEMP (DEG C)	SURFACE SALINITY (PPT)	BUCKET TEMP (DEG C)	BOTTLE SALINITY (PPT)
1	XBT	84183	113	36.47	122.10	11.2			
2	XBT	84183	200	36.53	122.21	11.6			
3	XBT	84183	300	36.59	122.31	11.6			
4	XBT	84183	407	37.04	122.41	11.9			
5	XBT	84183	503	37.09	122.50	11.8			
6	XBT	84183	603	37.15	122.58	12.0			
7	XBT	84183	700	37.21	123.06	12.3			
8	XBT	84183	815	37.28	123.17	12.2			
9	XBT	84183	906	37.33	123.25	12.9			
10	XBT	84183	1014	37.37	123.37	13.0			
11	XBT	84183	1105	37.42	123.45	12.6			
12	XBT	84183	1243	37.51	123.59	12.4			
13	XBT	84183	1350	37.57	124.10	12.7			
14	CTD	84183	1514	38.01	124.17	13.0	33.49	13.5	33.50
15	XBT	84183	1722	38.09	124.24	11.1			
16	XBT	84183	2036	38.28	124.38	12.0			
17	XBT	84183	2210	38.34	124.45	13.3			
18	XBT	84184	19	38.45	124.55	14.1			
19	XBT	84184	430	38.54	125.01	13.8			
20	XBT	84184	806	39.02	125.04	13.9			
21	XBT	84184	1106	39.09	125.11	14.0			
22	XBT	84184	1705	39.02	125.19	13.9			
23	XBT	84184	1800	38.52	125.21	14.0			
24	XBT	84184	1850	38.43	125.23	14.2			
25	XBT	84184	1957	38.32	125.27	13.8			
26	XBT	84184	2022	38.28	125.28	14.0			
27	XBT	84184	2102	38.20	125.28	14.0			
28	XBT	84184	2139	38.15	125.28	14.2			
29	CTD	84184	2224	38.10	125.31	13.8	32.62	14.4	*
30	XBT	84184	2344	38.00	125.36	13.8			
31	XBT	84185	228	37.30	125.43	13.6			
32	CTD	84185	335	37.20	125.43	13.2	33.44	13.5	33.04
33	XBT	84185	700	37.30	125.21	13.6			
34	XBT	84185	800	37.35	125.13	13.7			
35	XBT	84185	900	37.40	125.04	13.6			
36	XBT	84185	1000	37.46	124.52	13.7			
37	XBT	84185	1122	37.51	124.40	13.5			
38	XBT	84185	1206	37.57	124.28	13.8			
39	CTD	84185	1313	38.01	124.16	13.8	33.45	14.0	32.68
40	XBT	84185	1444	38.03	124.30	13.6			
41	XBT	84185	1544	38.03	124.44	11.8			
42	XBT	84185	1636	38.05	124.59	12.2			
43	XBT	84185	1722	38.05	125.08	13.9			
44	XBT	84185	1810	38.07	125.21	14.1			
45	CTD	84185	1938	38.10	125.31	14.1	32.65	14.4	32.69

* Data not available

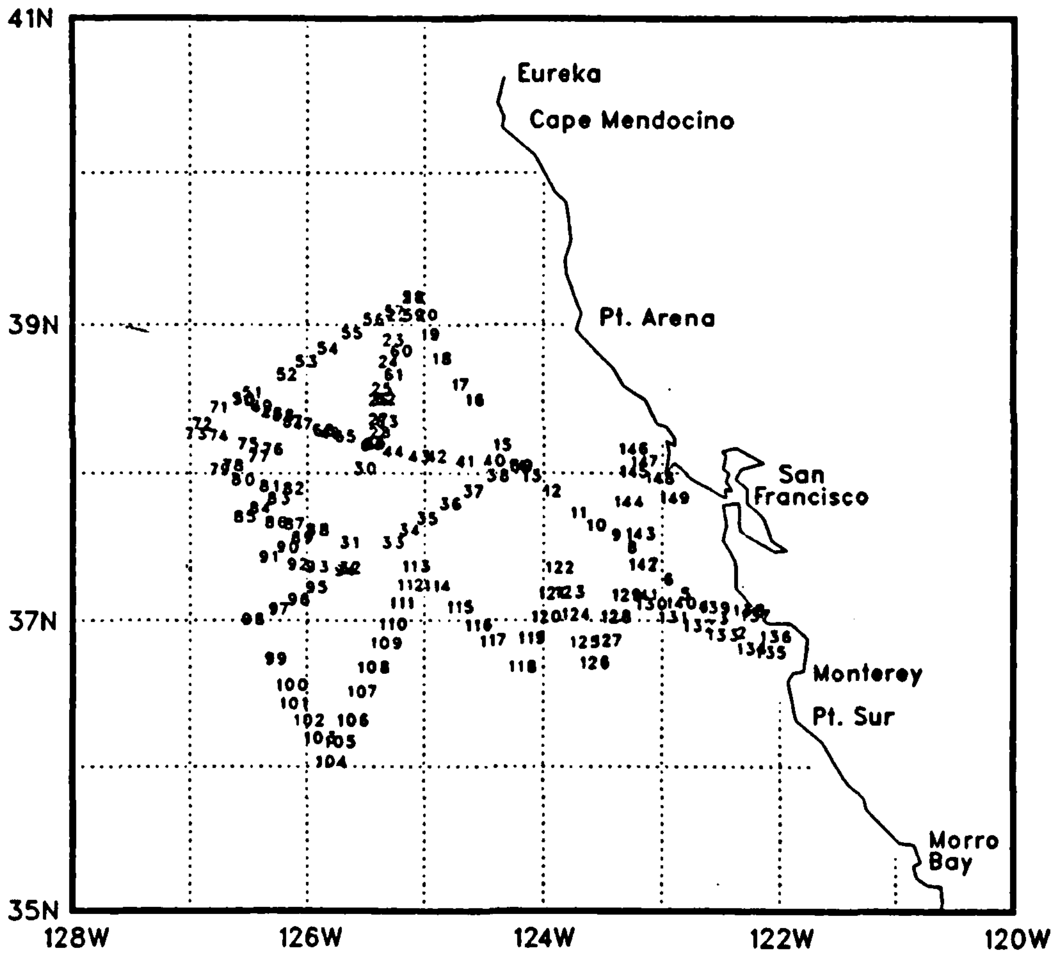


Figure 5 : XBT/CTD station numbers for OPTOMA11, Leg DII.

Table II : Radiosonde Station Listing

STN	TYPE	YR/DAY	GMT	LAT (NORTH) (DD.MM)	LONG (WEST) (DDD.MM)	SURFACE PRESS (MB)	SURFACE TDRY (DEG C)	SURFACE TWET (DEG C)	MIXING RATIO (G/KG)
1	SONDE	84183	1437	36.45	122.00	1008.30	13.10	12.10	8.50
2	SONDE	84183	1746	38.11	124.26	1010.20	13.30	12.90	9.00
3	SONDE	84183	2349	38.42	124.54	1010.00	14.50	13.70	9.50
4	SONDE	84184	1321	39.13	125.14	1008.40	14.00	12.30	8.20
5	SONDE	84184	1754	38.53	125.21	1010.50	14.00	12.90	8.90
6	SONDE	84185	4	37.56	125.39	1010.70	14.60	15.40	11.30
7	SONDE	84185	605	37.24	125.32	1010.20	14.50	13.30	9.00
8	SONDE	84185	1806	38.09	125.14	1011.50	14.50	13.60	9.30
9	SONDE	84185	2348	38.23	126.15	1012.00	15.10	14.30	9.80
10	SONDE	84186	605	38.47	125.56	1011.00	14.80	13.70	9.30
11	SONDE	84186	1159	39.05	125.09	1010.20	13.20	13.10	9.30
12	SONDE	84186	1848	38.13	125.42	1011.90	14.20	14.30	10.10
13	SONDE	84187	33	38.25	126.47	1013.00	15.20	14.30	9.90
14	SONDE	84187	605	38.06	126.28	1011.40	17.00	15.00	9.80
15	SONDE	84187	1155	37.52	126.20	1009.40	14.80	13.20	8.70
16	SONDE	84187	1817	37.37	126.12	1009.20	14.00	12.00	7.90
17	SONDE	84188	35	37.19	125.57	1010.40	15.40	14.50	9.90
18	SONDE	84189	1	36.34	125.35	1009.00	14.70	13.70	9.40
19	SONDE	84189	603	36.59	125.21	1008.40	14.10	13.40	9.20
20	SONDE	84189	1922	36.40	124.19	1010.00	13.90	14.70	10.40
21	SONDE	84189	2357	36.57	124.05	1008.70	14.30	13.50	9.30
22	SONDE	84190	559	36.55	123.47	1004.30	13.60	13.30	9.30
23	SONDE	84190	1806	36.52	122.37	1006.70	11.40	11.20	8.30
24	SONDE	84191	118	36.56	122.15	1007.70	12.[illegible]0	13.30	9.40
25	SONDE	84191	612	37.05	122.58	1011.30	13.60	12.30	8.30
26	SONDE	84192	606	37.53	123.04	1009.90	12.70	12.00	8.40

All values are at 2.0 meters

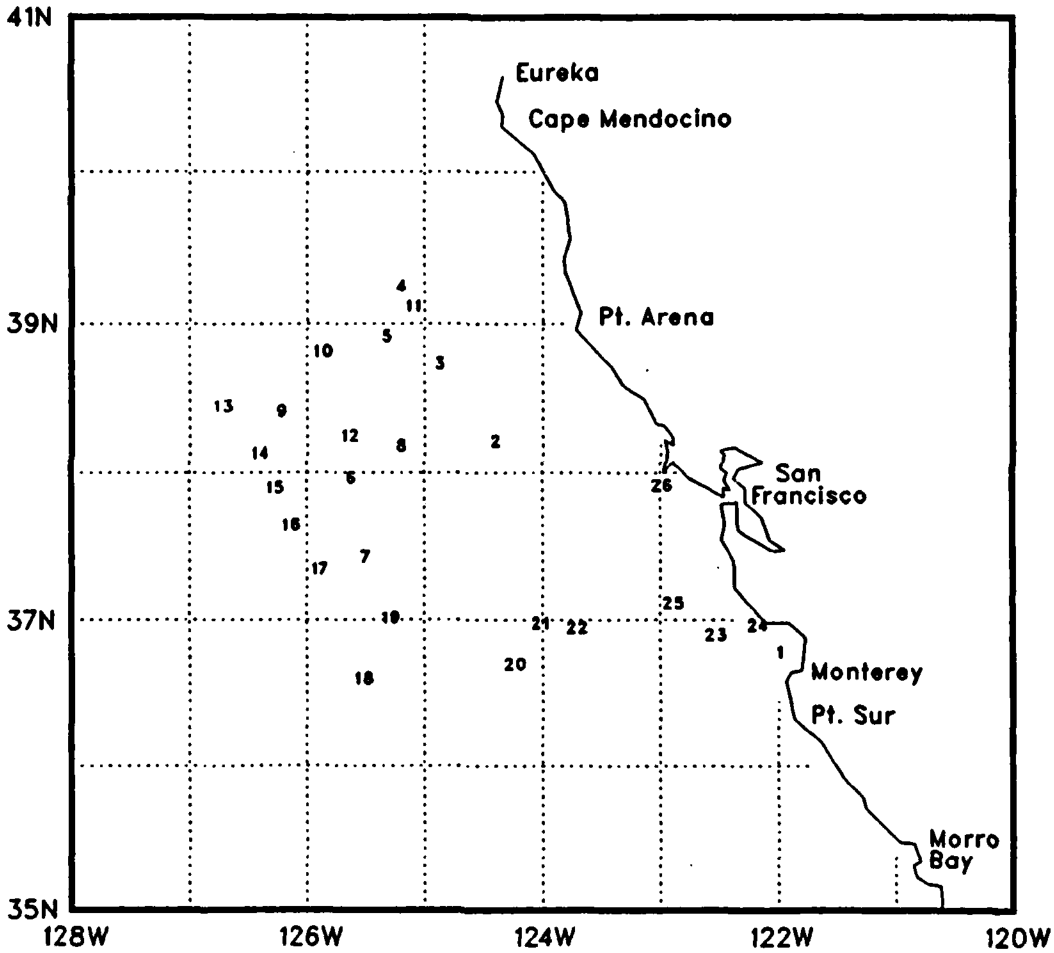


Figure 4: Radiosonde station numbers for OPTOMA11, Leg DII.

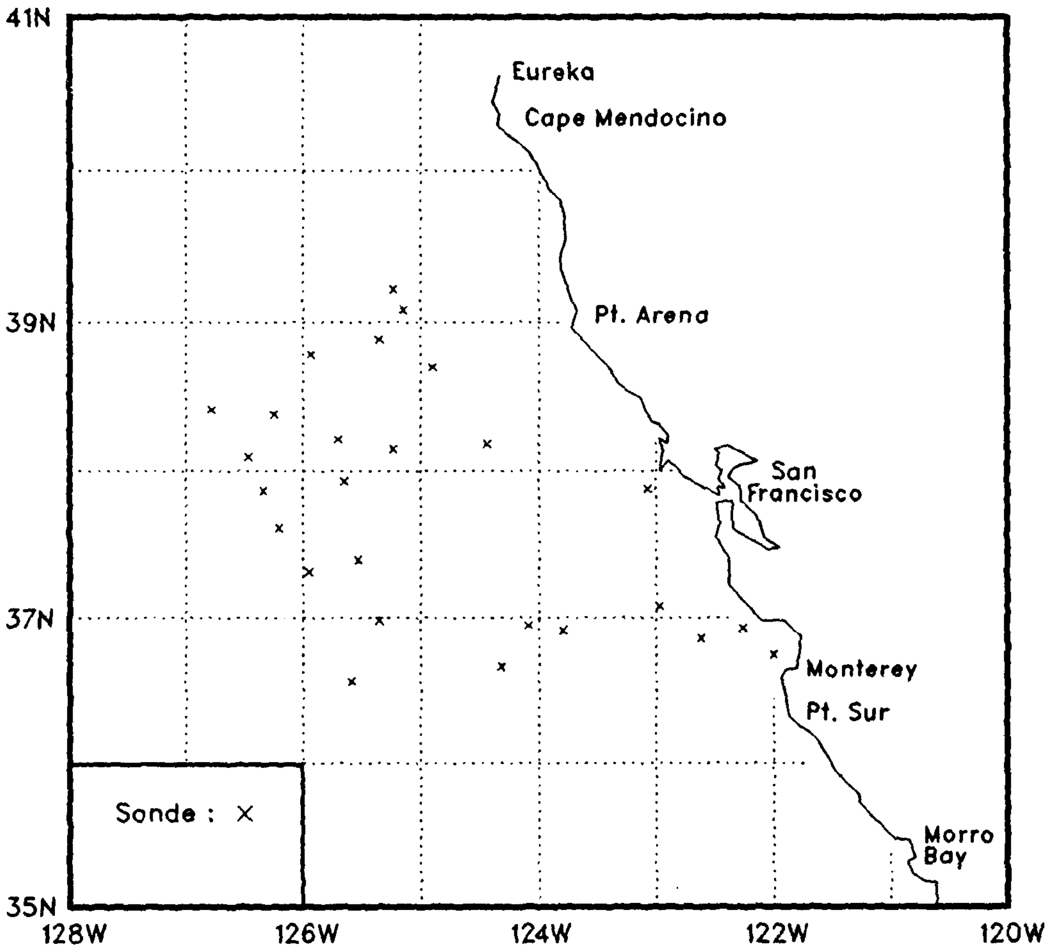


Figure 3 : Radiosonde positions for OPTOMAII, Leg DII.

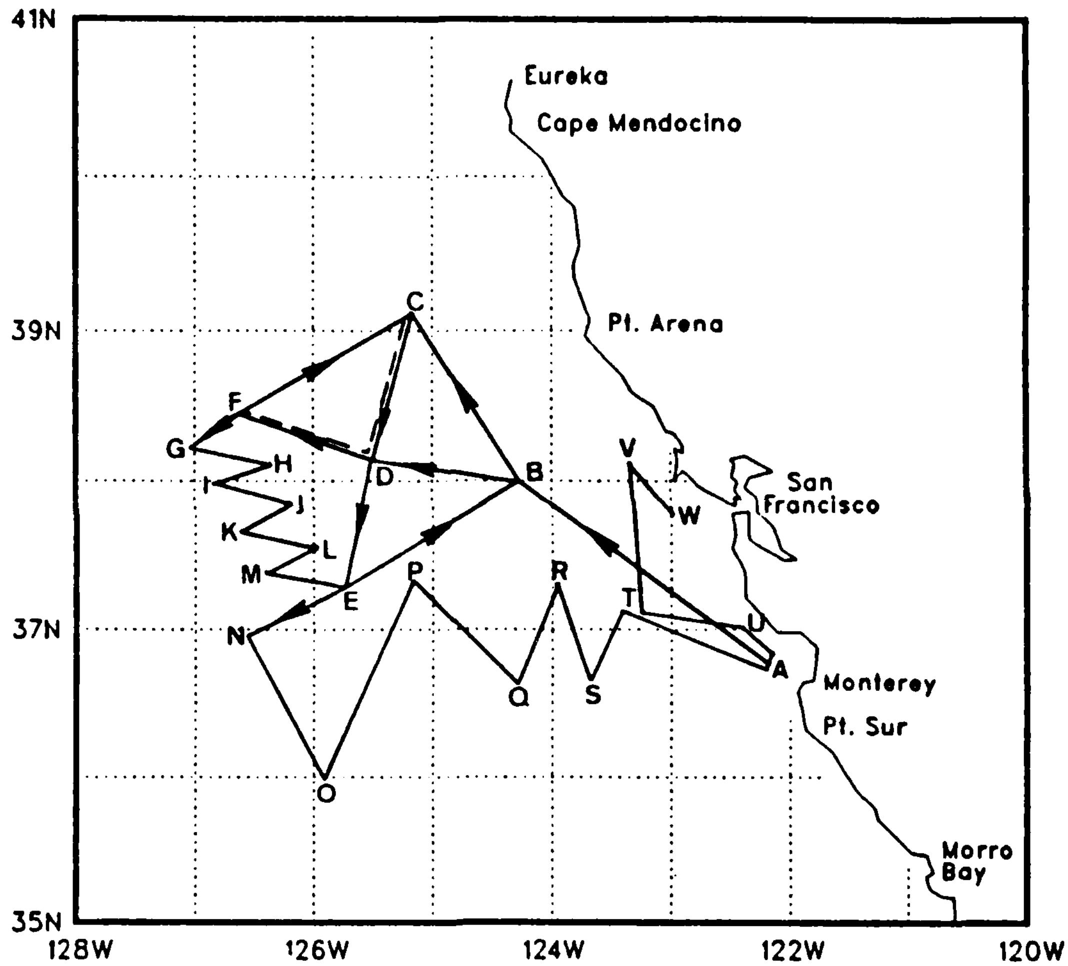


Figure 2 : The cruise track for OPTOMA11, Leg DII. The second traversal of the interior semi-diagonals is shown as a broken line.

the radiosondes are shown in Figures 6 (a)-(m). The positions of these profiles may be found by reference to the station number plot, Figure 4. The mean potential temperature profile from the radiosondes is shown in Figure 7.

To compare the atmospheric profiles to the oceanic profiles, the radiosondes to 700m or 800m and the XBT profiles to 500m or 750m, depending on the depth rating of the XBT, are plotted together in Figures 8 (a)-(l). The potential temperature is shown in degrees Celsius to allow the two temperature and humidity profiles to be plotted on the same abscissa. The specific humidity is in cgs units.

The hourly dry-bulb and wet-bulb temperatures plotted for the period 1 to 10 July are shown in Figure 9. A time series of the hourly true wind speed is shown in Figure 10, with true wind velocity below the curve to indicate direction. The directed segments all originate on the abscissa and they all point in the direction to which the wind is blowing.

The data presentation section concludes with a reproduction of a NOAA-7 AVHRR infrared image obtained on 7 July 84 (Figure 11), and a tracing which shows the superposition of the NOCAL domain on the salient features of the infrared image (Figure 12). The image shows the cool, offshore jet which was present in the NOCAL domain for the duration of OPTOMA11, Leg DII.

National Weather Service surface pressure analyses at synoptic times 0000Z and 1200Z for the period 1 to 10 July 84 are provided in Appendix A.

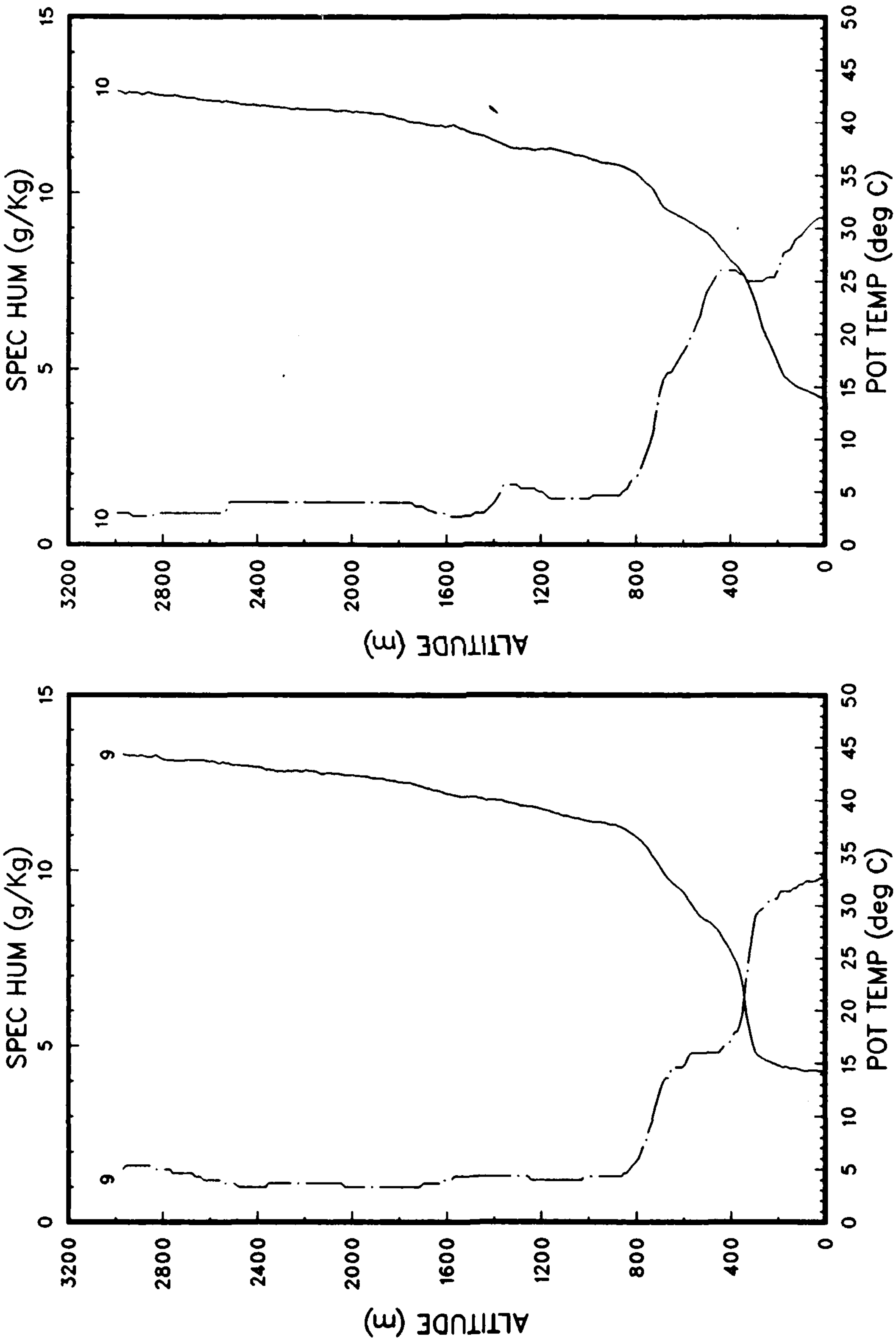


Figure 6(e).

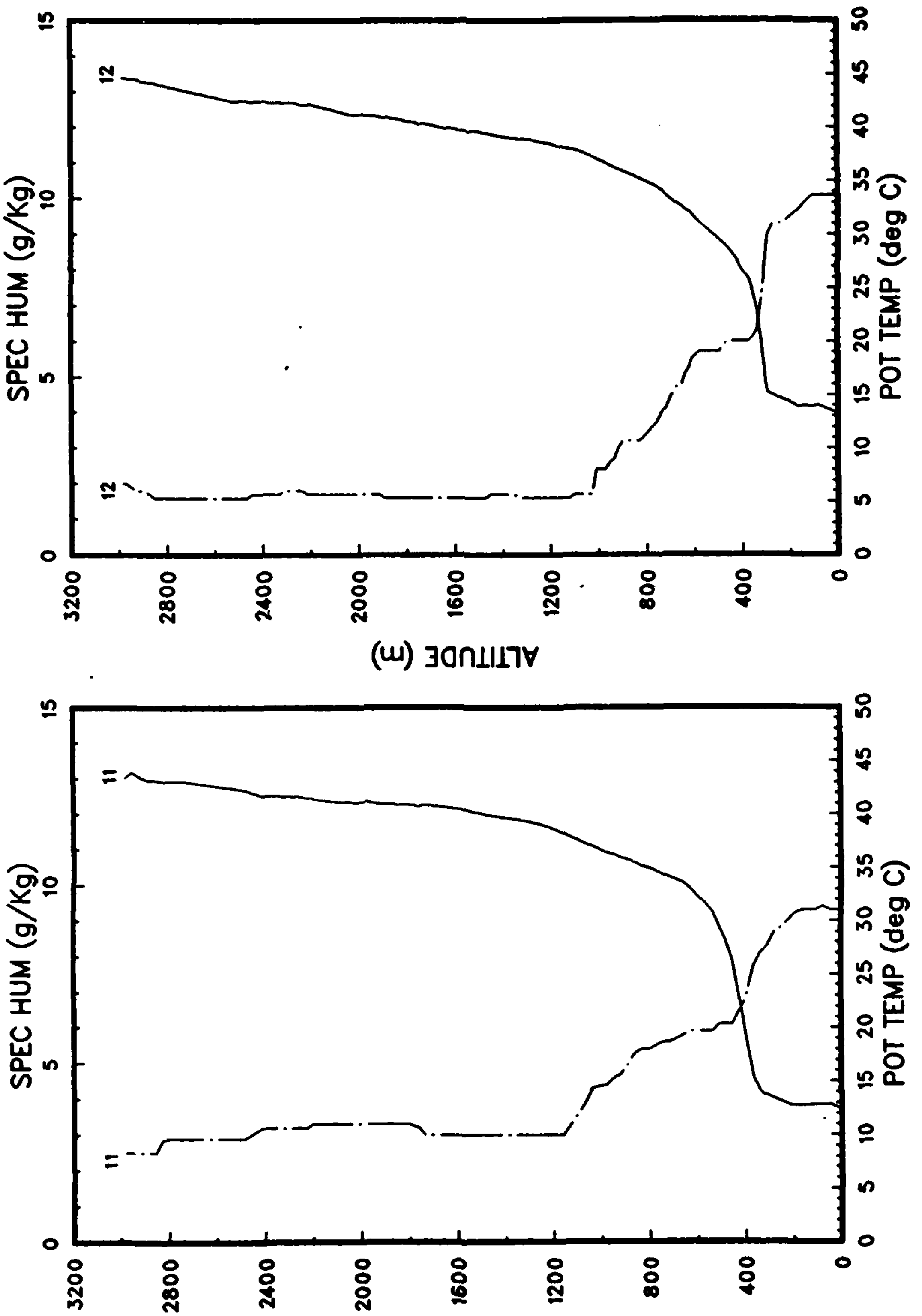


Figure 6(f).

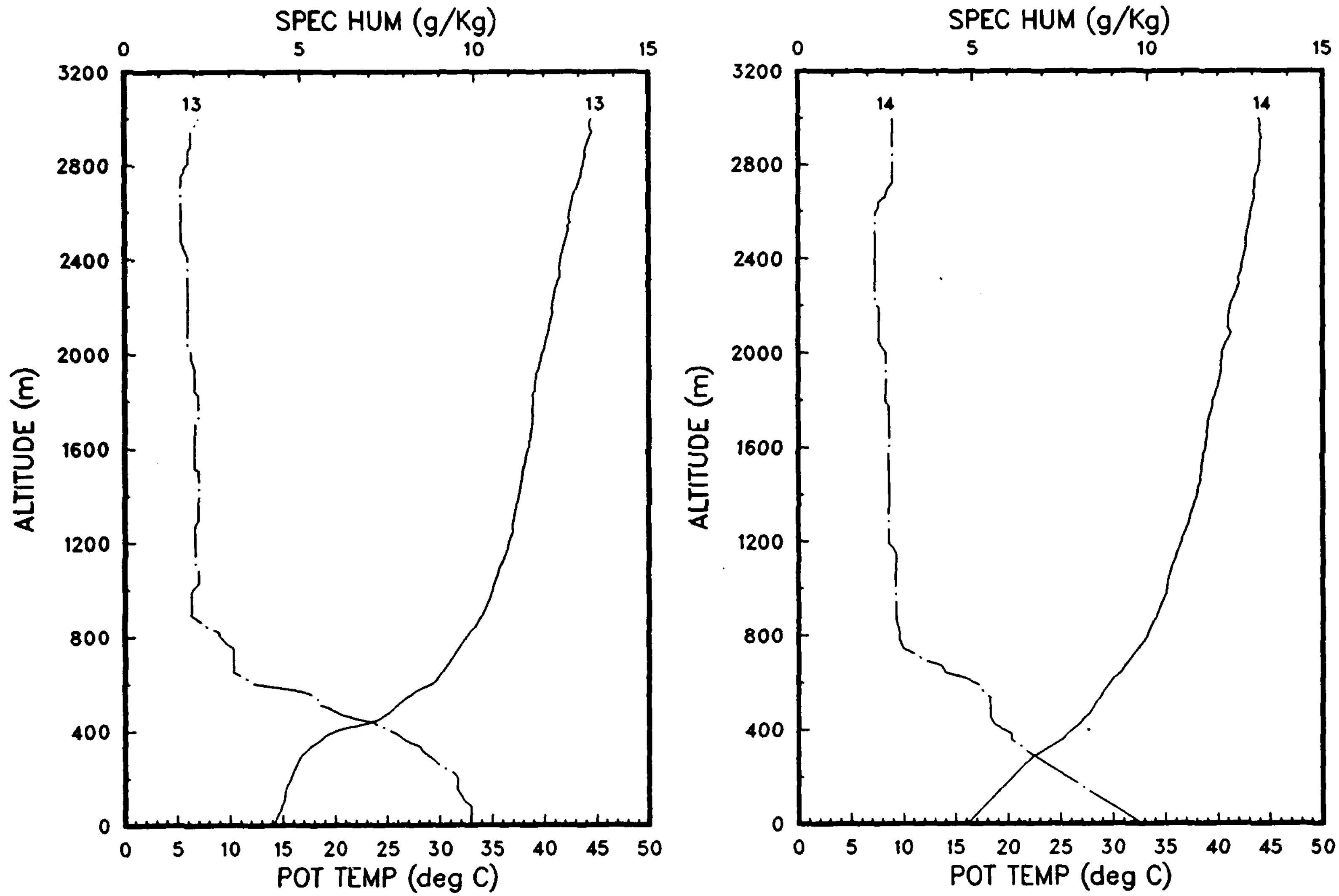

SPEC HUM (g/Kg)
ALTITUDE (m)
POT TEMP (deg C)
13
13
SPEC HUM (g/Kg)
ALTITUDE (m)
POT TEMP (deg C)
14
14

Figure 6(g).

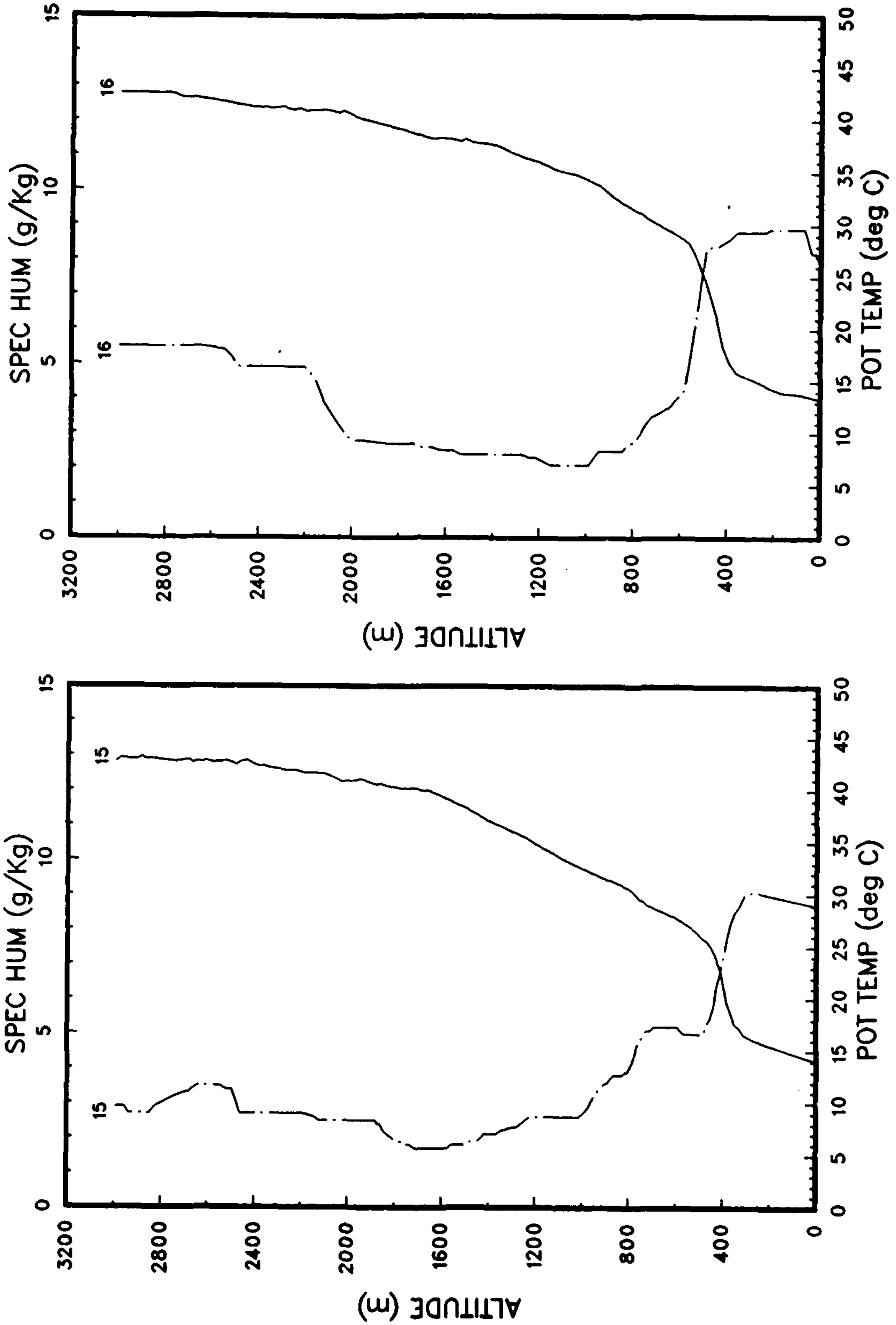

SPEC HUM (g/Kg)
POT TEMP (deg C)
ALTITUDE (m)
16
15
0
5
10
15
20
25
30
35
40
45
50
3200
2800
2400
2000
1600
1200
800
400

Figure 6(h).

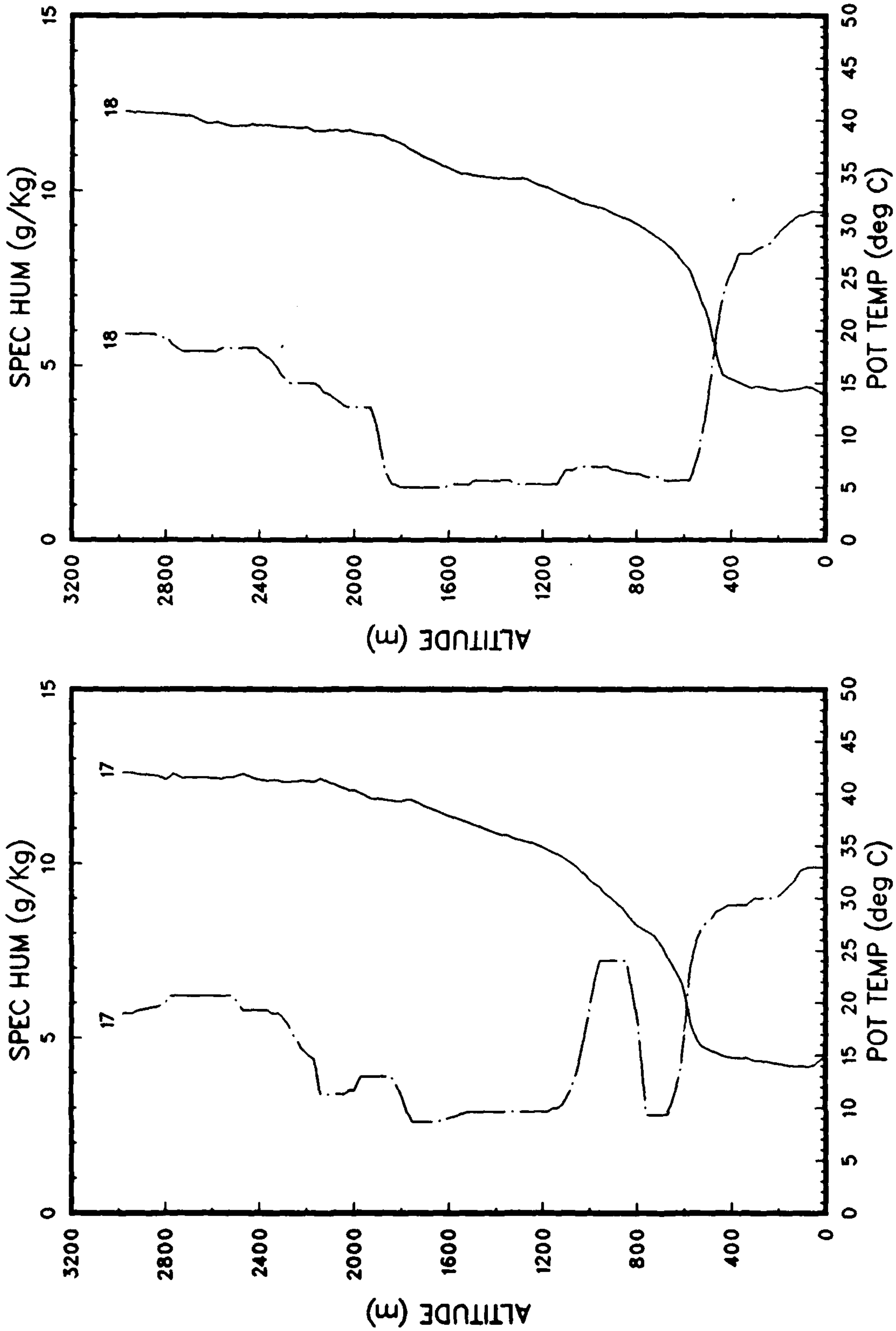

SPEC HUM (g/Kg)
POT TEMP (deg C)
ALTITUDE (m)
18
18
17
17
0
5
10
15
0
5
10
15
20
25
30
35
40
45
50
3200
2800
2400
2000
1600
1200
800
400
0

Figure 6(i).

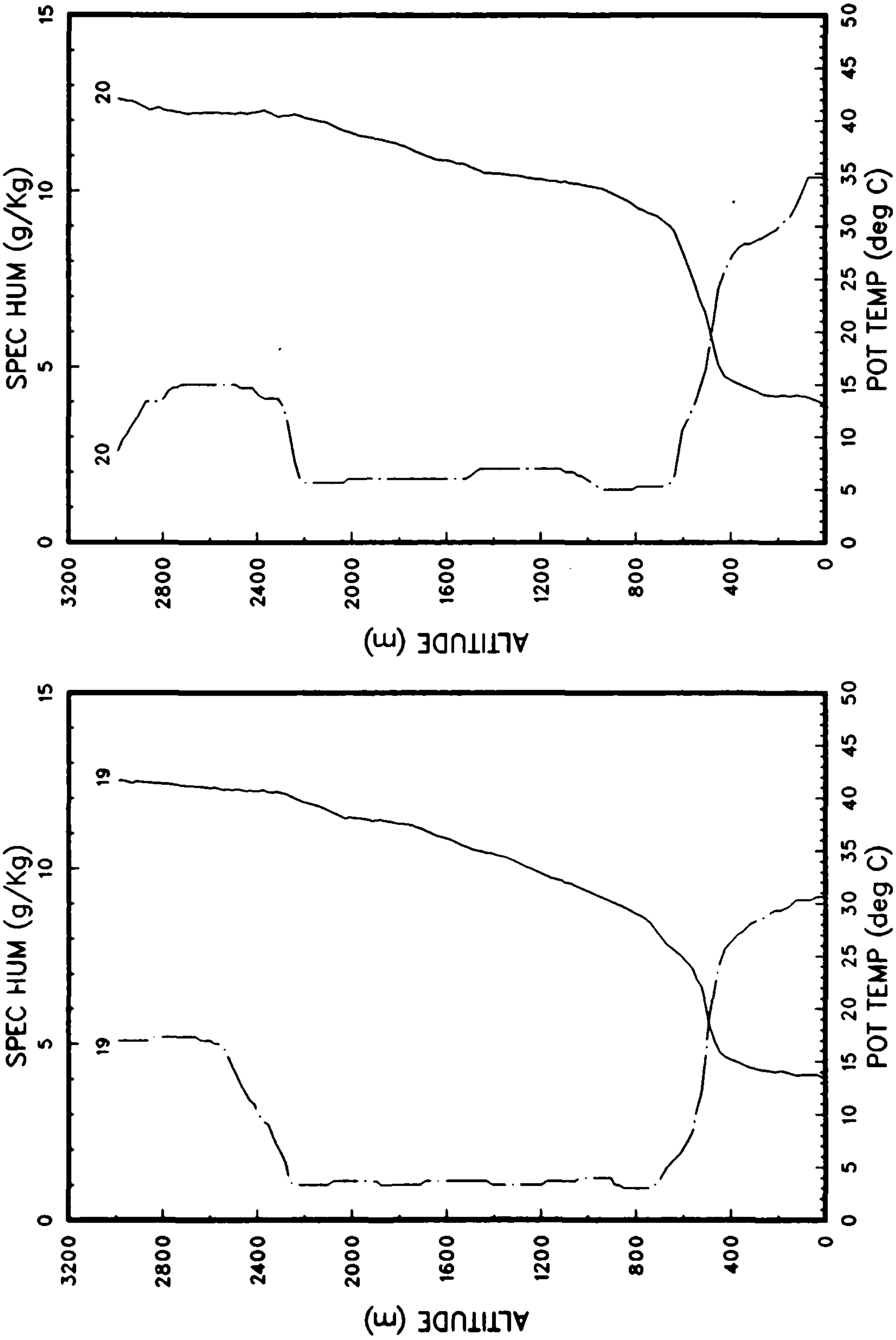
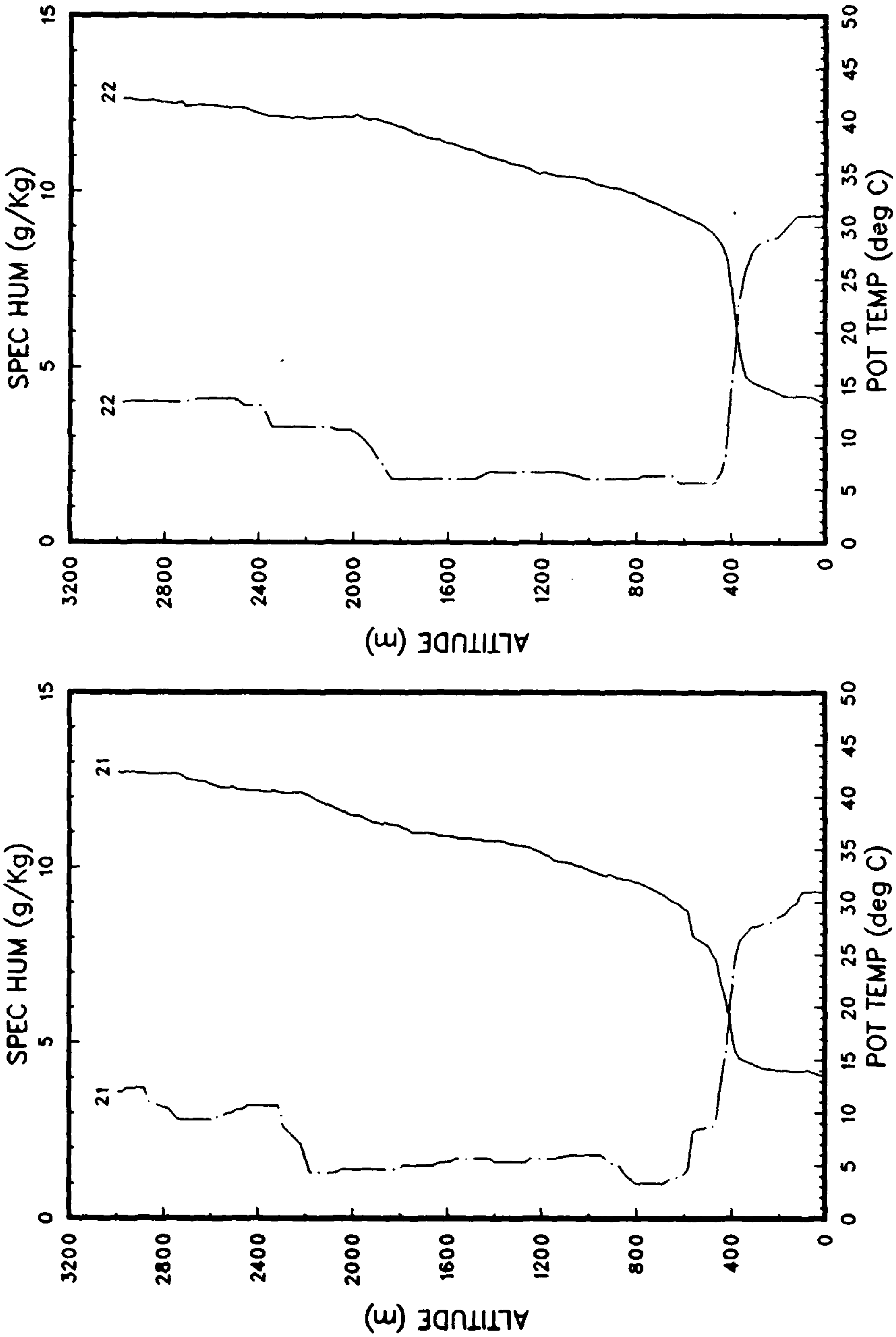

SPEC HUM (g/Kg)
0
5
10
15
ALTITUDE (m)
3200
2800
2400
2000
1600
1200
800
400
0
POT TEMP (deg C)
0
5
10
15
20
25
30
35
40
45
50
20
20
SPEC HUM (g/Kg)
0
5
10
15
ALTITUDE (m)
3200
2800
2400
2000
1600
1200
800
400
0
POT TEMP (deg C)
0
5
10
15
20
25
30
35
40
45
50
19
19

Figure 6(j).



SPEC HUM (g/Kg)
0
5
10
15
ALTITUDE (m)
3200
2800
2400
2000
1600
1200
800
400
0
POT TEMP (deg C)
0
5
10
15
20
25
30
35
40
45
50
22
22
21
21

Figure 6(k).

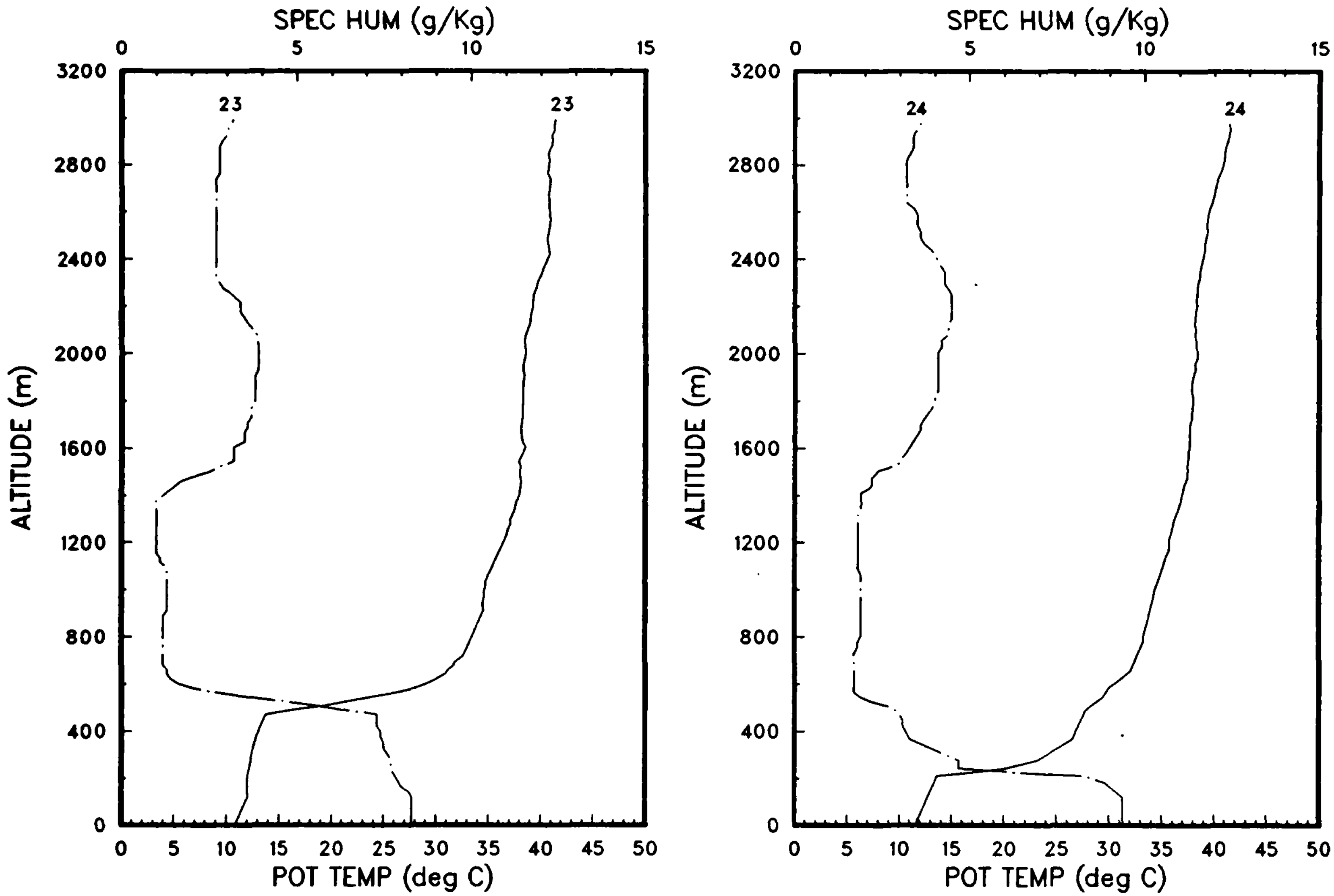

SPEC HUM (g/Kg)
0
5
10
15
3200
2800
2400
2000
1600
1200
800
400
0
ALTITUDE (m)
23
23
0
5
10
15
20
25
30
35
40
45
50
POT TEMP (deg C)
SPEC HUM (g/Kg)
ALTITUDE (m)
24
24
POT TEMP (deg C)

Figure 6(1).

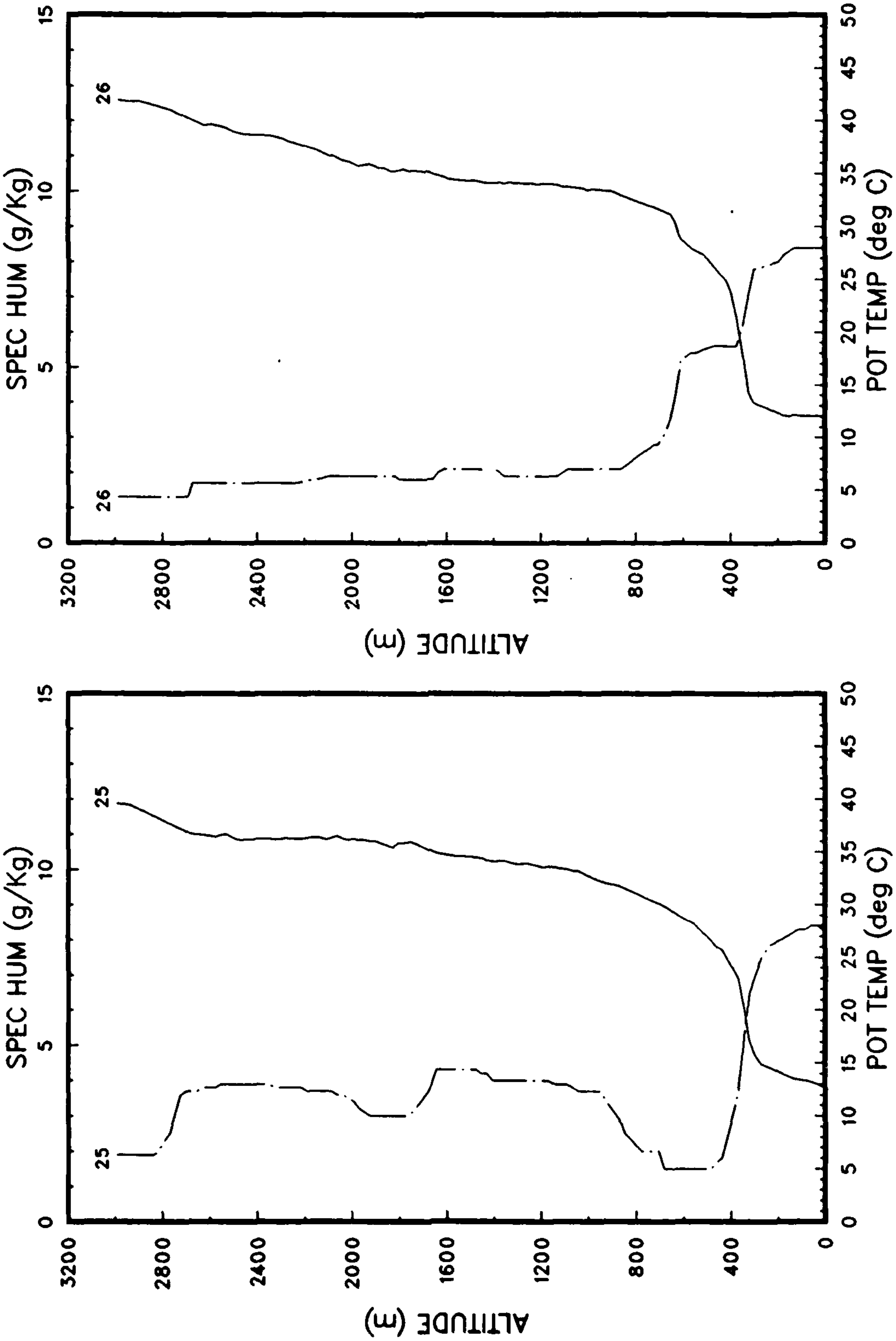


Figure 6(m).

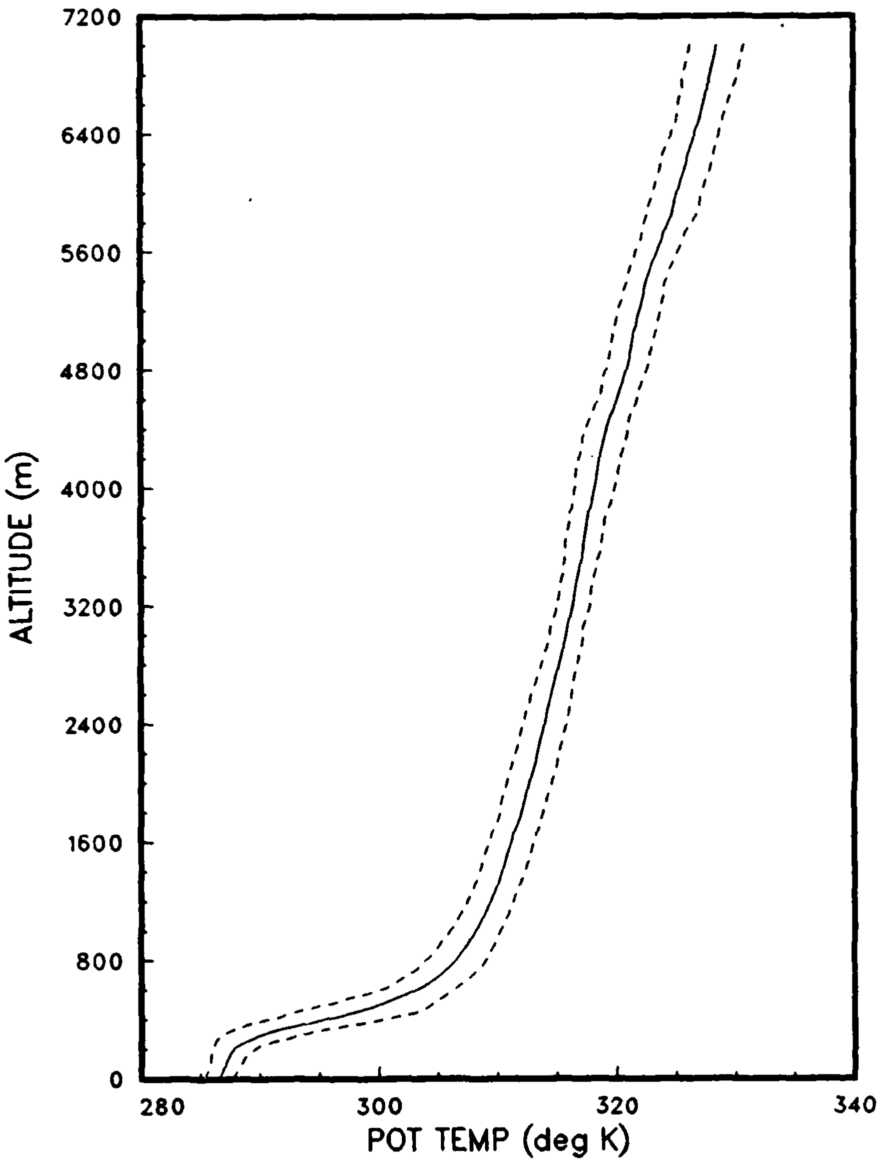


Figure 7 : Profile of mean potential temperature with + and - the standard deviation (OPTOMAll, DII).

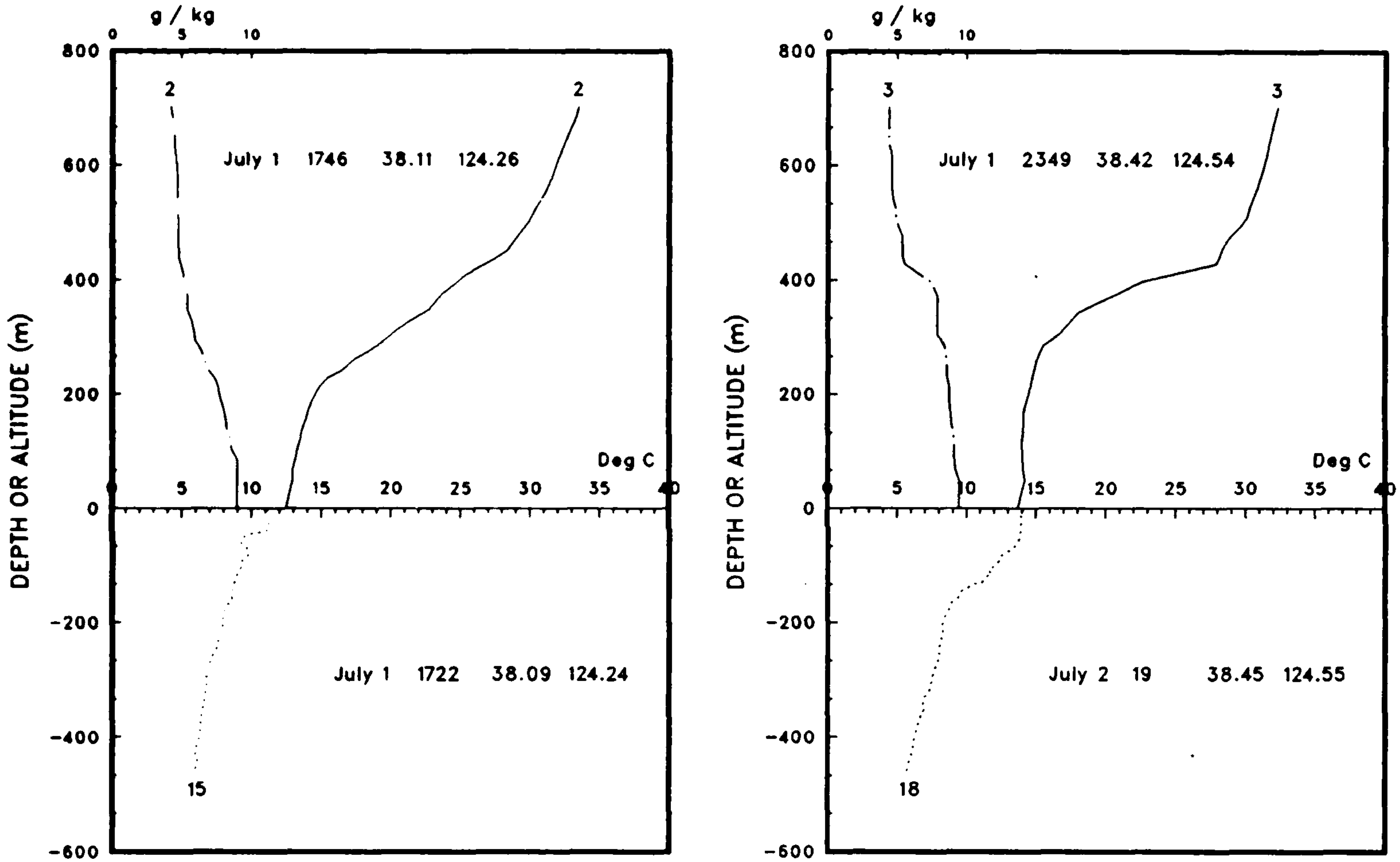


Figure 8(a): Radiosonde potential temperature (———) and specific humidity (—·—) profiles to 750m (800m) and nearly coincident XBT temperature profiles to 500m (750m) to show the air/sea interface and boundary layers. The date, time (GMT), latitude (North) and longitude (West) of each profile is shown.

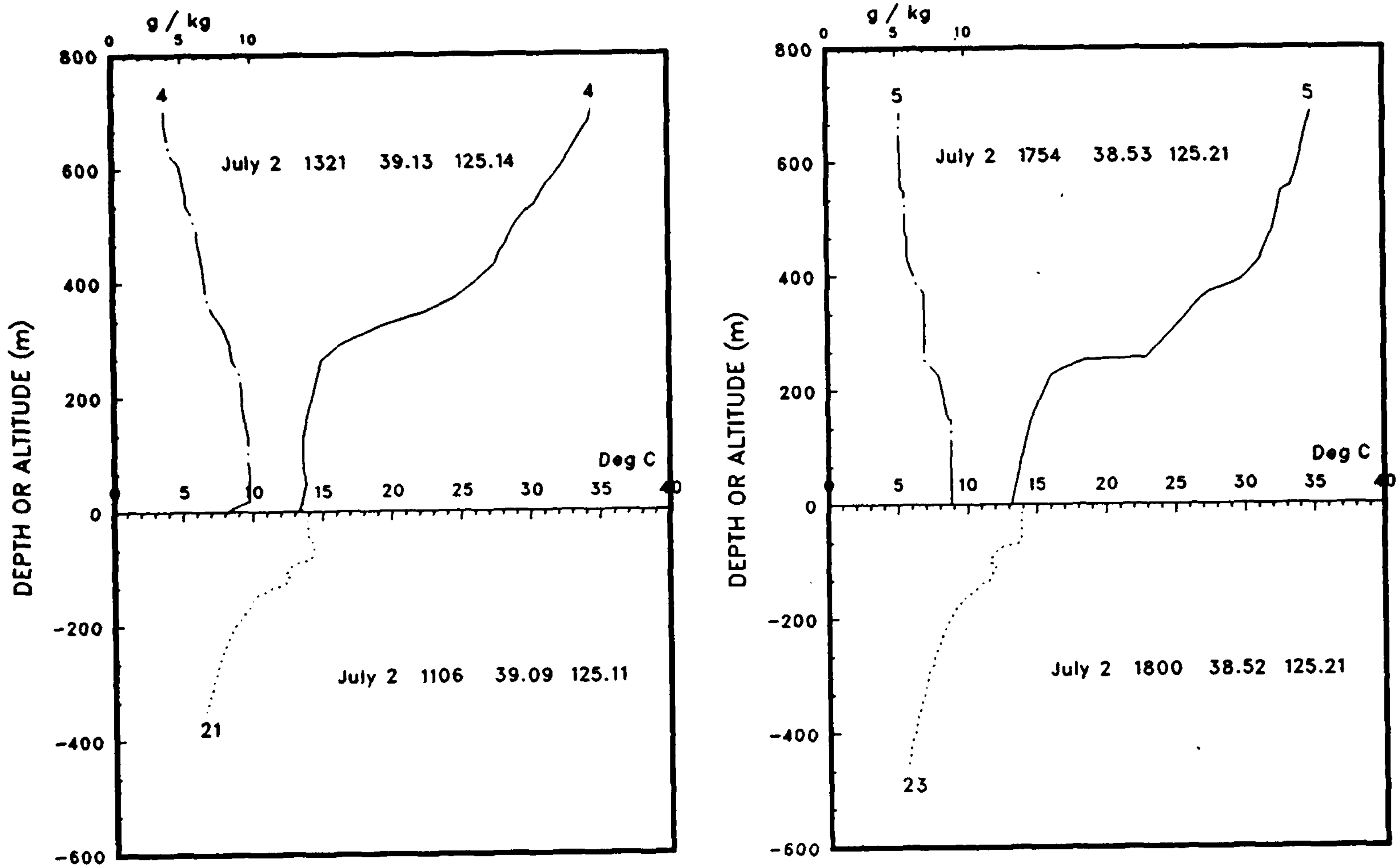
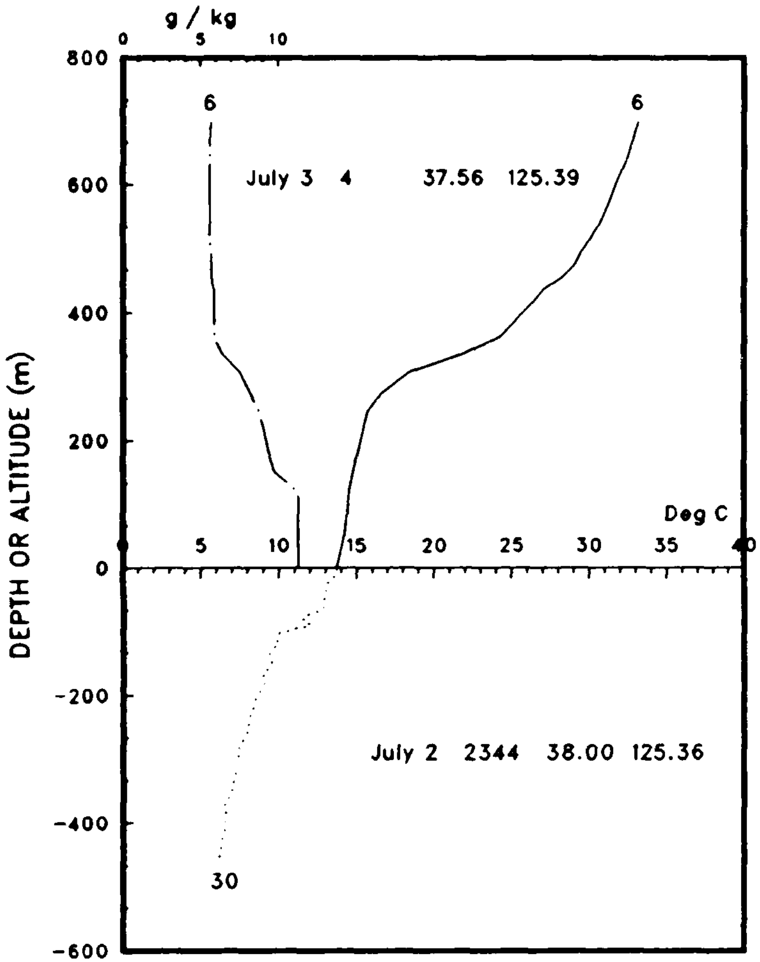

g / kg
0
5
10
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
4
4
July 2 1321 39.13 125.14
Deg C
5
10
15
20
25
30
35
40
July 2 1106 39.09 125.11
21
g / kg
0
5
10
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
5
5
July 2 1754 38.53 125.21
Deg C
5
10
15
20
25
30
35
40
July 2 1800 38.52 125.21
23

Figure 8(b).


g / kg
0
5
10
DEPTH OR ALTITUDE (m)
800
600
400
200
0
-200
-400
-600
6
6
July 3 4 37.56 125.39
Deg C
5
10
15
20
25
30
35
40
July 2 2344 38.00 125.36
30

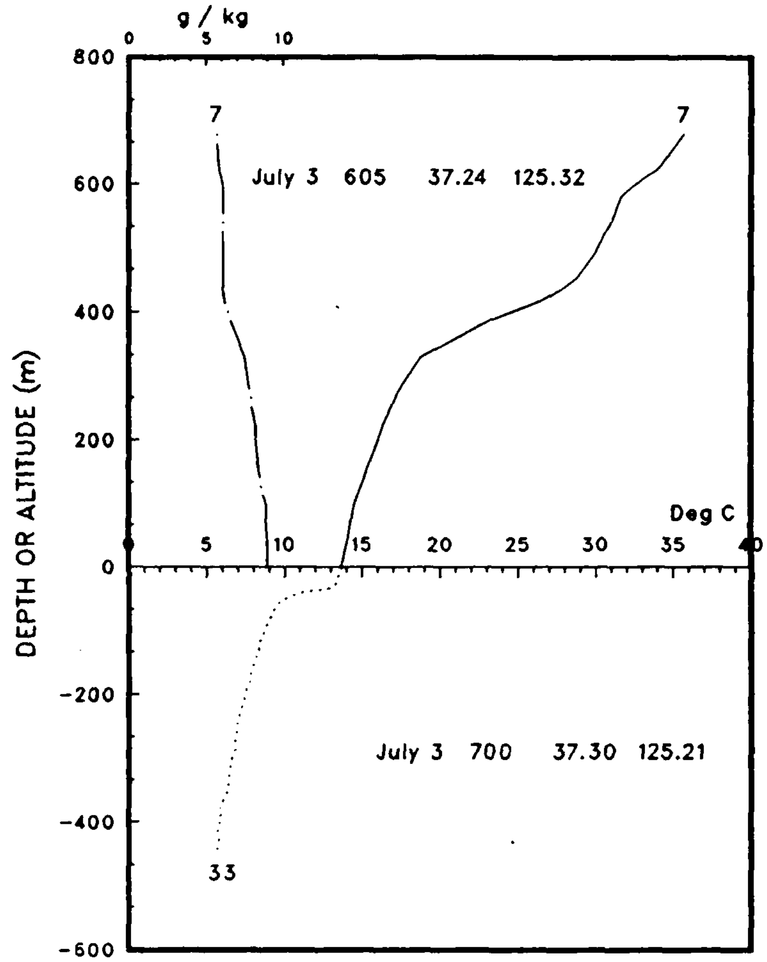

g / kg
0
5
10
DEPTH OR ALTITUDE (m)
800
600
400
200
0
-200
-400
-600
7
7
July 3 605 37.24 125.32
Deg C
5
10
15
20
25
30
35
40
July 3 700 37.30 125.21
33

Figure 8(c).

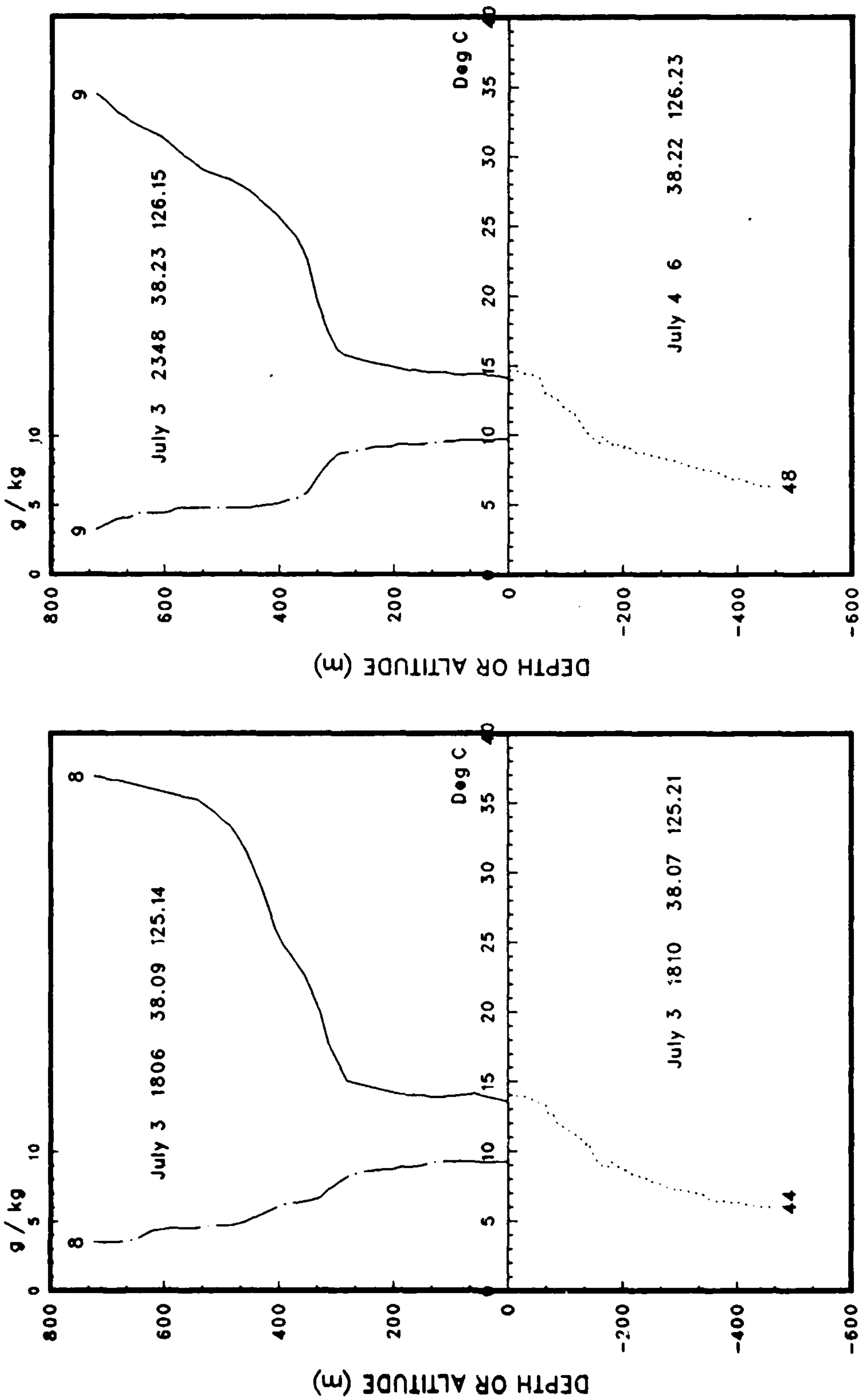

DEPTH OR ALTITUDE (m)
g / kg
Deg C
July 3 2348 38.23 126.15
July 4 6 38.22 126.23
July 3 1806 38.09 125.14
July 3 1810 38.07 125.21

Figure 8(d).

APPENDIX A

The following charts are from the National Weather Service northern hemisphere surface pressure analyses at synoptic times 0000Z and 1200Z for the period 1 to 10 July, 1984 (synoptic times 0600Z and 1200Z for 6 July 84), as noted in the bottom left-hand corner of each map.

ACKNOWLEDGEMENTS

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Members of the scientific cruise party were:

Prof. C.N.K. Mooers, Chief Scientist, NPS
Ms. Marie C. Colton, Party Chief, NPS
Mr. Luke Chung, Harvard
AG3 Mary Robinette, FNOC
AG3 Lisa Campbell, FNOC
DP2 Marianne Drewett, FNOC
Mr. Robert Sylvia, LSU

REFERENCES

Wittmann, P.A.; Rienecker, M.M.; Kelley, Jr., E.A.; Mooers, C.N.K, ***Hydrographic Data from the OPTOMA Program, OPTOMA11, 5 June to 5 August, 1984***, NPS Technical Report No. NPS-68-85-011, March, 1985.

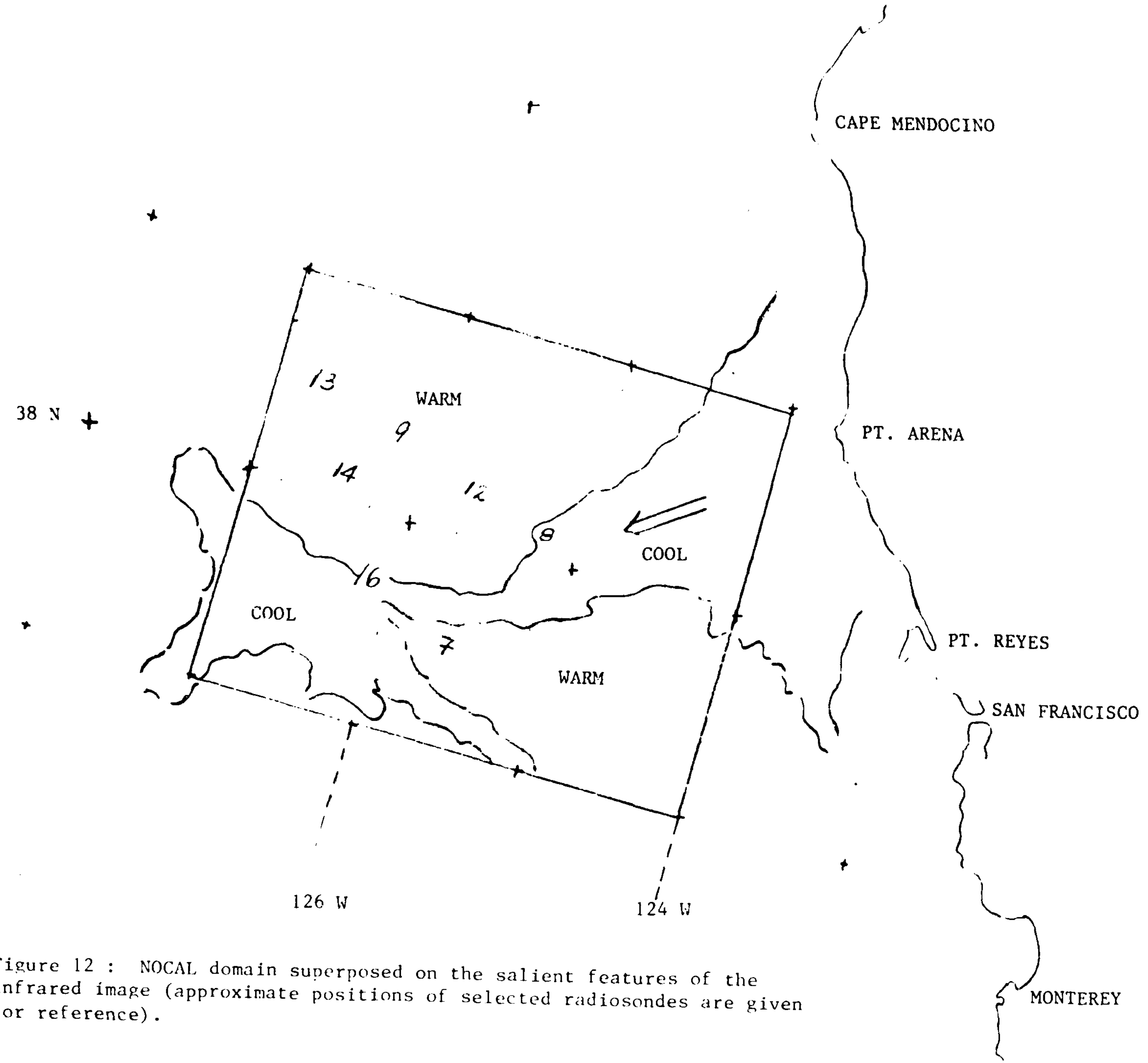


Figure 12 : NOCAL domain superposed on the salient features of the infrared image (approximate positions of selected radiosondes are given for reference).

Figure 11 : NOAA-7 AVHRR infrared image from 2336Z, 7 July 85 (Channel 4).

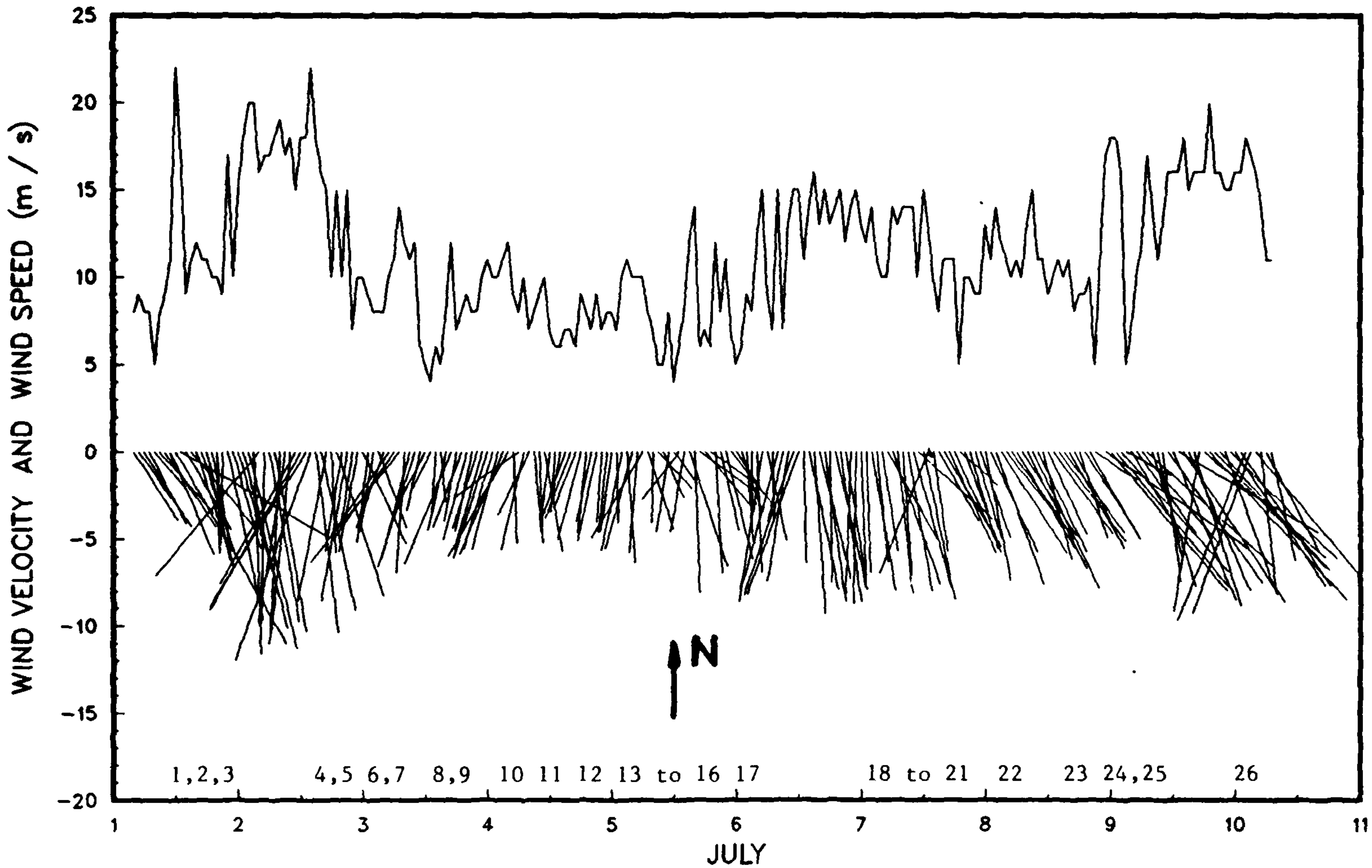


Figure 10 : Time-series of hourly true wind speed with true wind velocity sticks below the curve to indicate direction (North is given by the arrow). The time axis is annotated with the radiosonde station numbers at their approximate launch times (OPTOMA11, Leg DII).

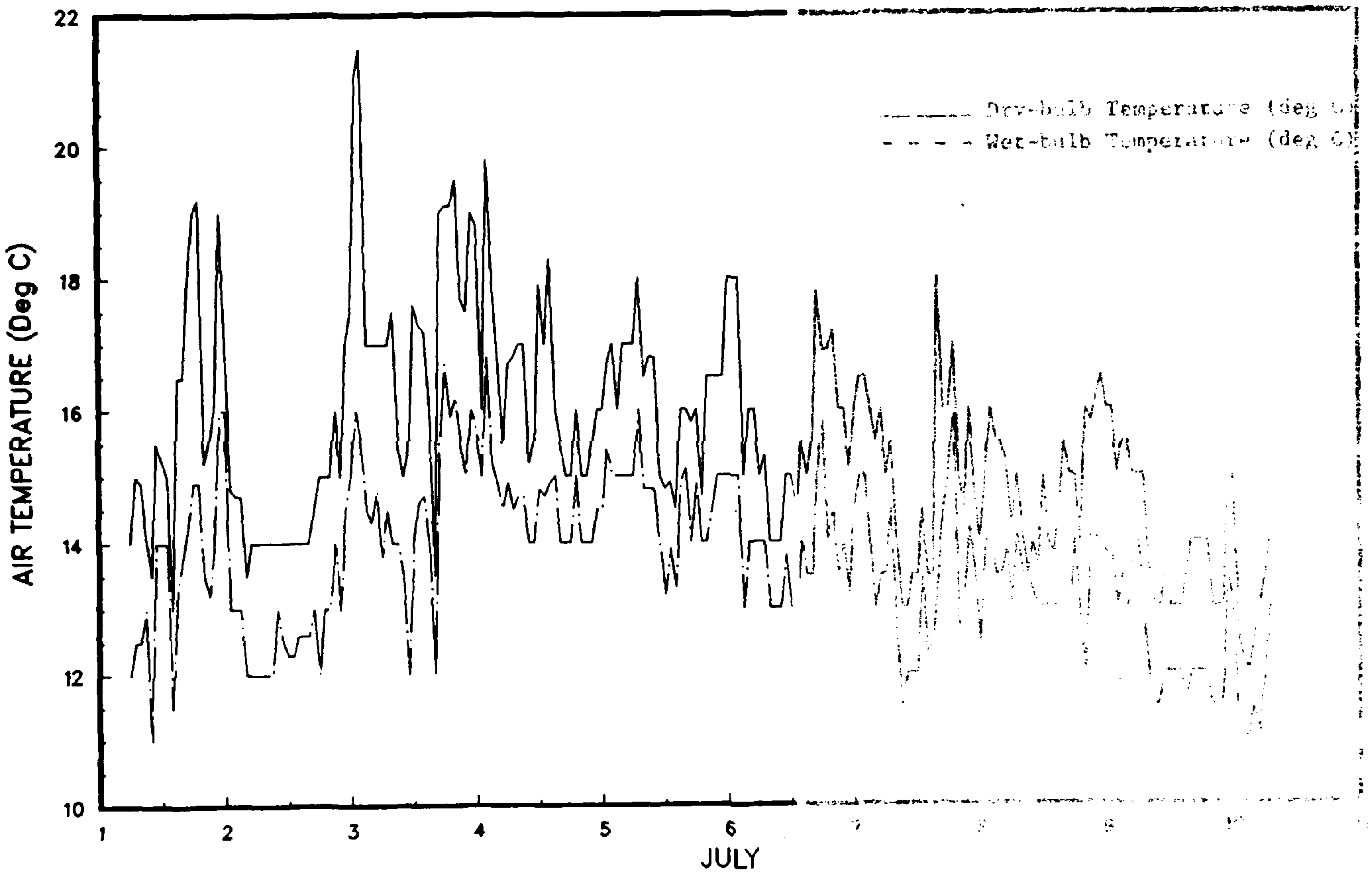


Figure 9 : Time-series of hourly dry-bulb and wet-b

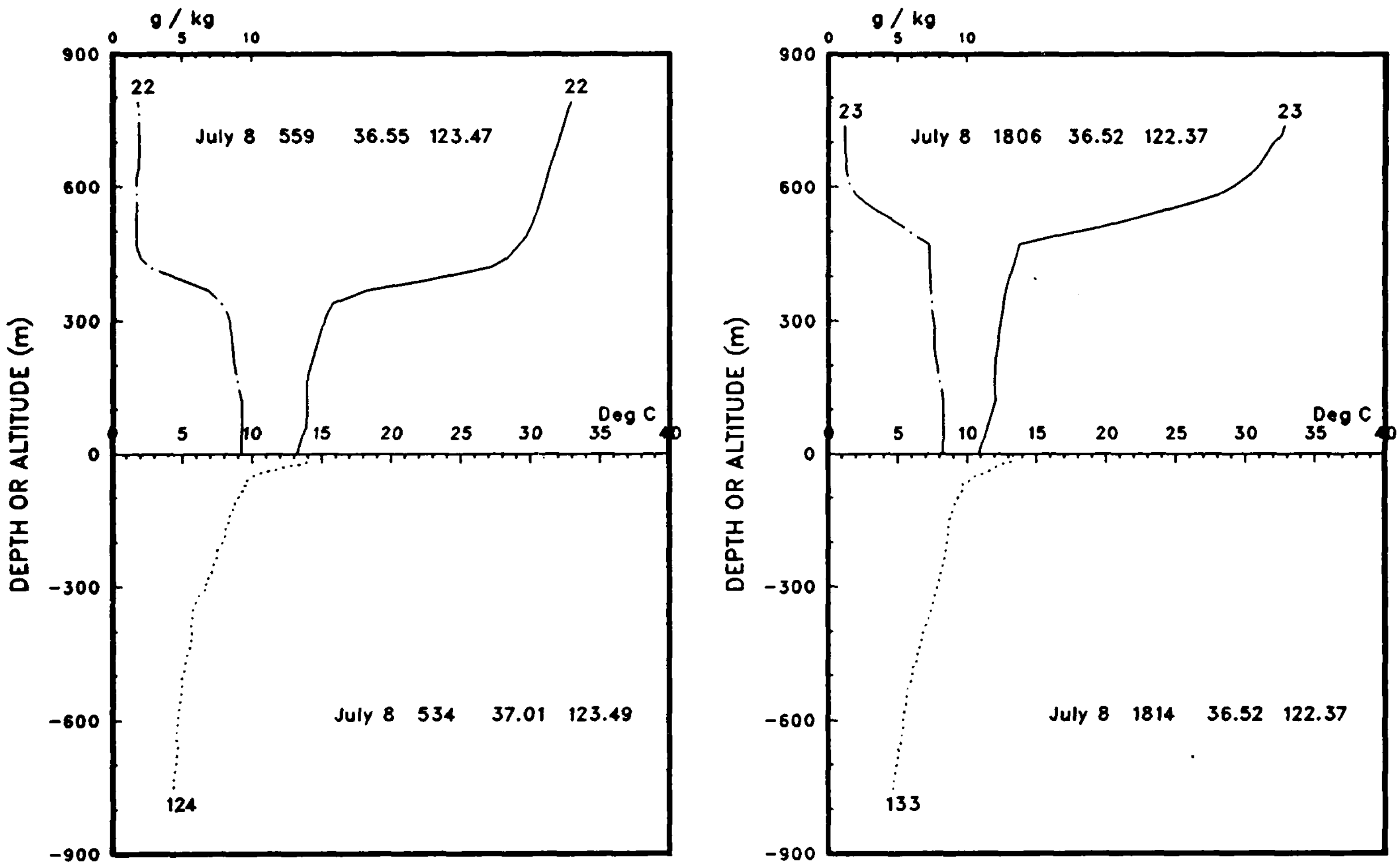

g / kg
0
5
10
900
600
300
0
-300
-600
-900
DEPTH OR ALTITUDE (m)
Deg C
5
10
15
20
25
30
35
40
22
22
July 8 559 36.55 123.47
July 8 534 37.01 123.49
124
23
23
July 8 1806 36.52 122.37
July 8 1814 36.52 122.37
133

Figure 8(1).

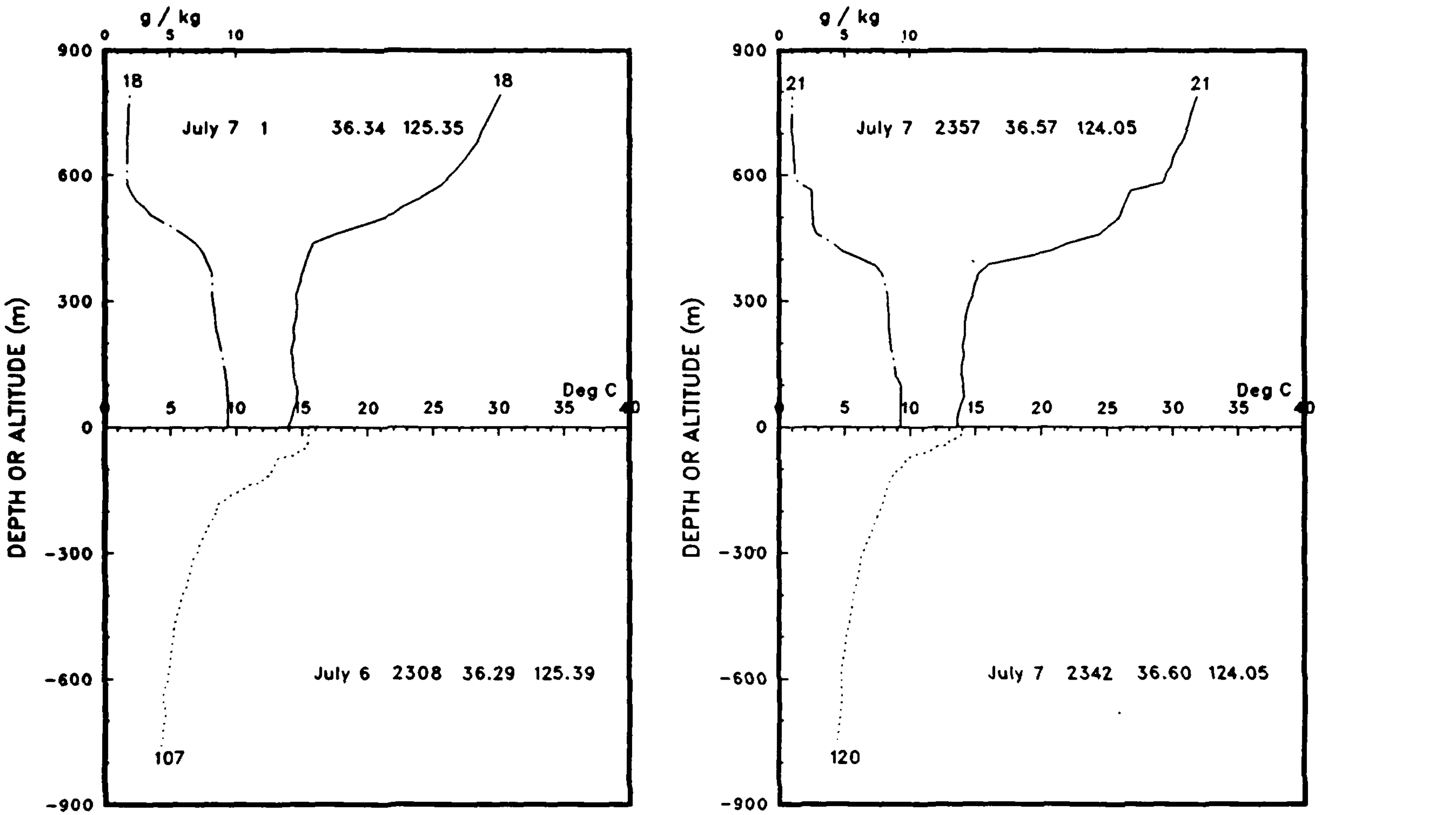


Figure 8(k): Notice that the vertical scale has now been changed to accomodate the T-7 (750m) XBT's.

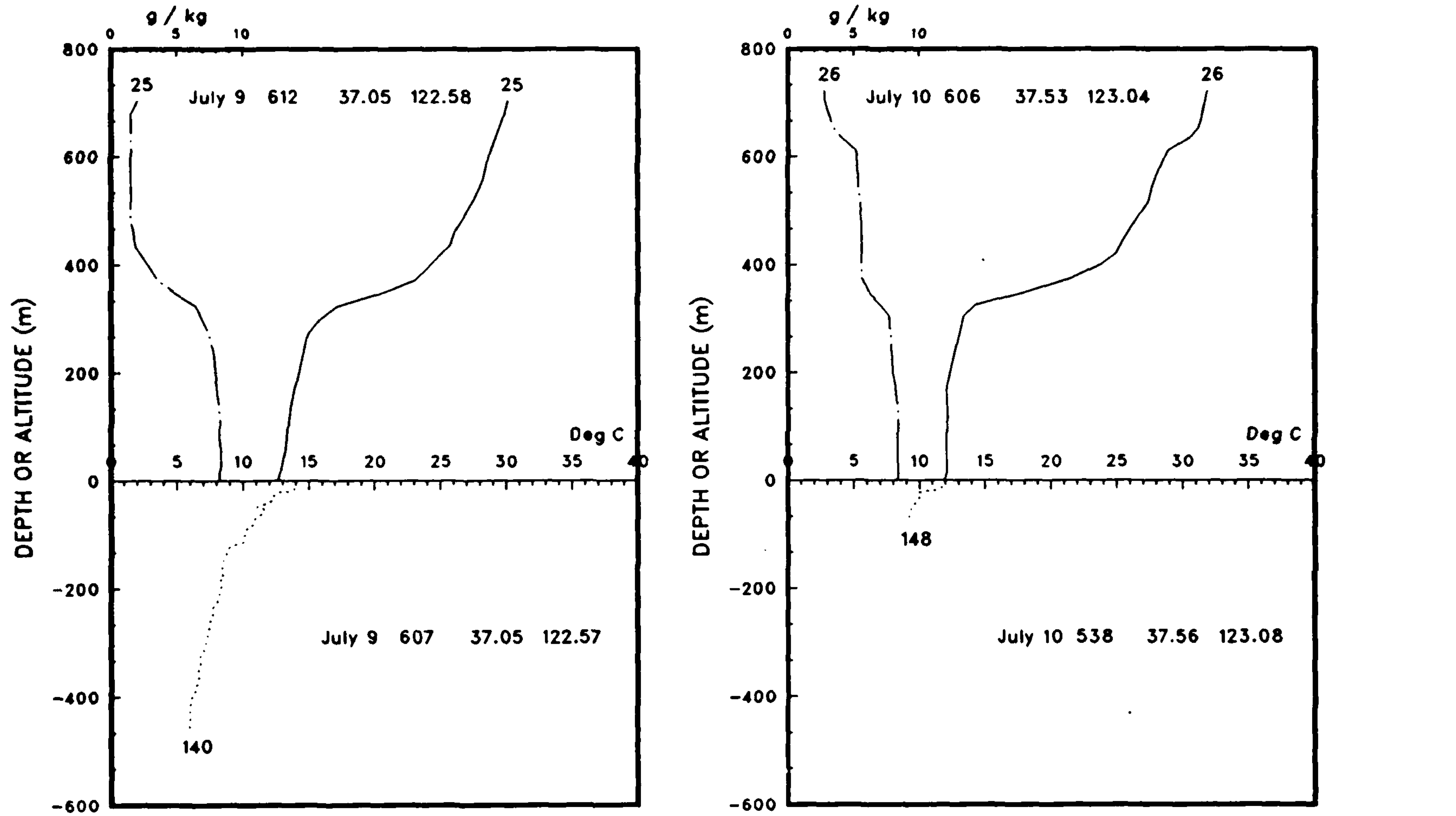
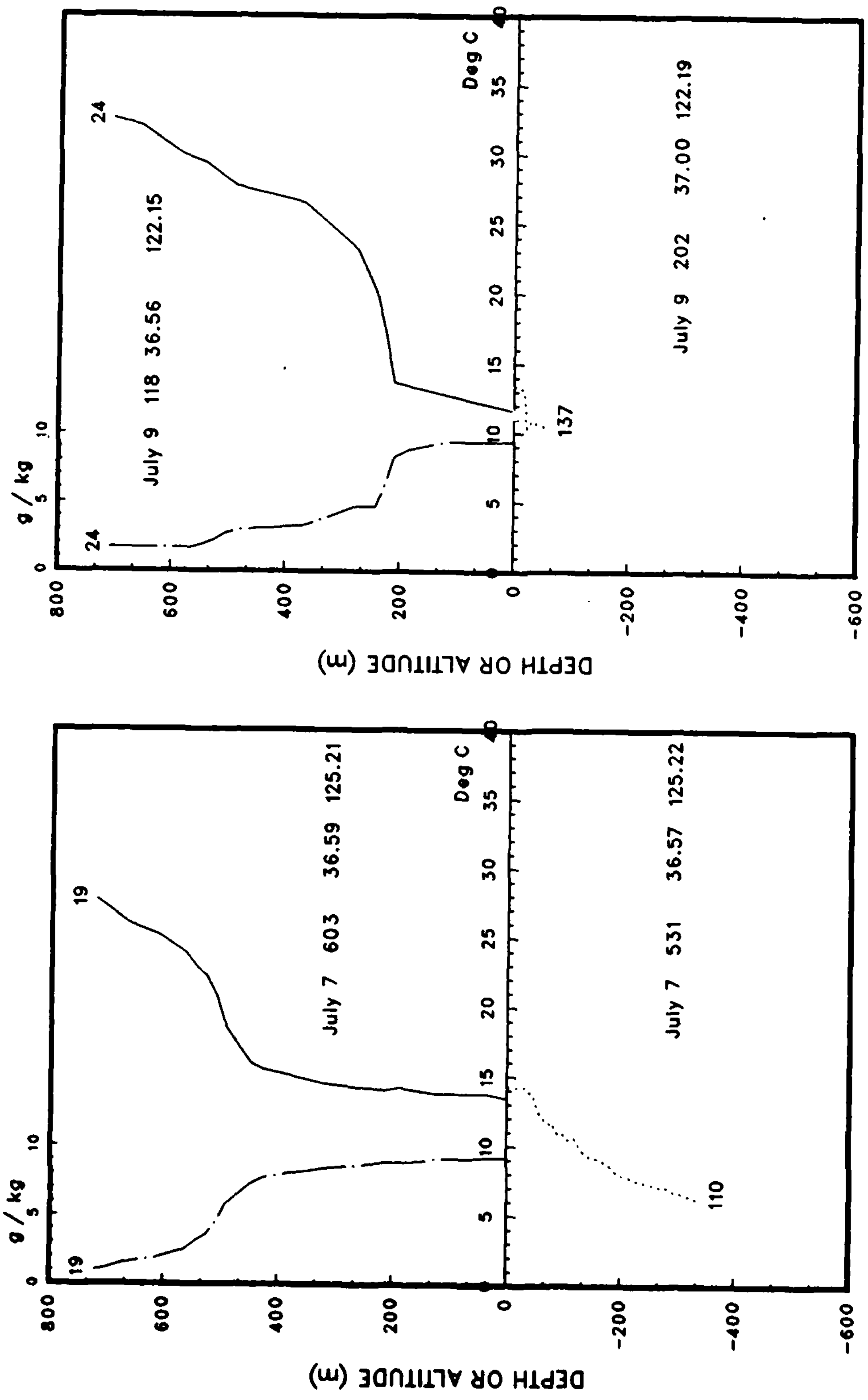

g / kg
0
5
10
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
25
July 9 612 37.05 122.58
25
Deg C
5
10
15
20
25
30
35
40
140
July 9 607 37.05 122.57
g / kg
0
5
10
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
26
July 10 606 37.53 123.04
26
Deg C
5
10
15
20
25
30
35
40
148
July 10 538 37.56 123.08

Figure 8(j).



DEPTH OR ALTITUDE (m)
g / kg
Deg C
July 9 118 36.56 122.15
July 9 202 37.00 122.19
24
137
July 7 603 36.59 125.21
July 7 531 36.57 125.22
19
110

Figure 8(i).

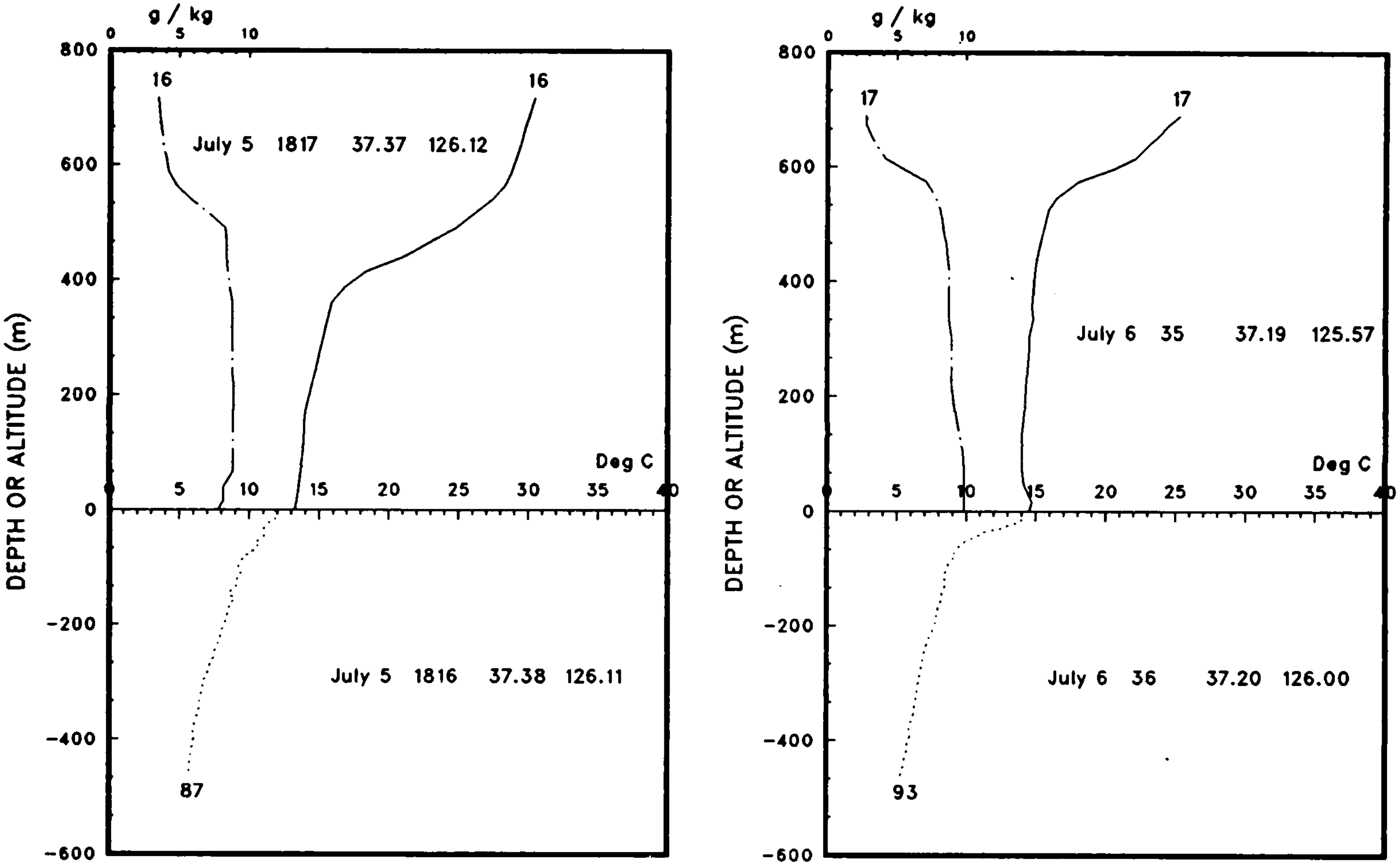

g / kg
0
5
10
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
16
16
July 5 1817 37.37 126.12
Deg C
5
10
15
20
25
30
35
40
July 5 1816 37.38 126.11
87
17
17
July 6 35 37.19 125.57
July 6 36 37.20 126.00
93

Figure 8(h).

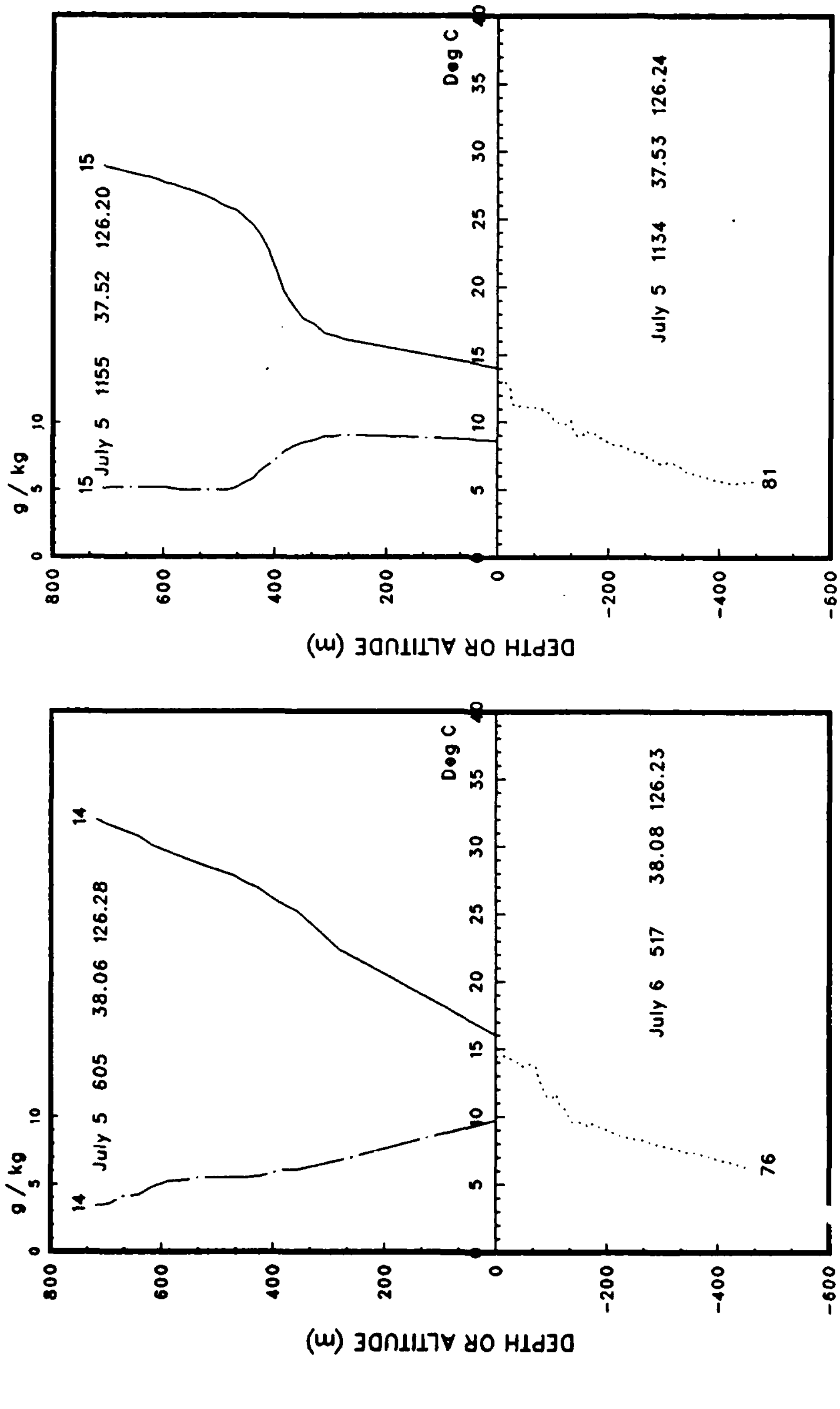

g / kg
0
5
10
15
July 5 1155 37.52 126.20
15
20
25
30
35
40
Deg C
July 5 1134 37.53 126.24
81
800
600
400
200
0
-200
-400
-600
DEPTH OR ALTITUDE (m)
g / kg
14
July 5 605 38.06 126.28
14
Deg C
July 6 517 38.08 126.23
76
DEPTH OR ALTITUDE (m)

Figure 8(g).

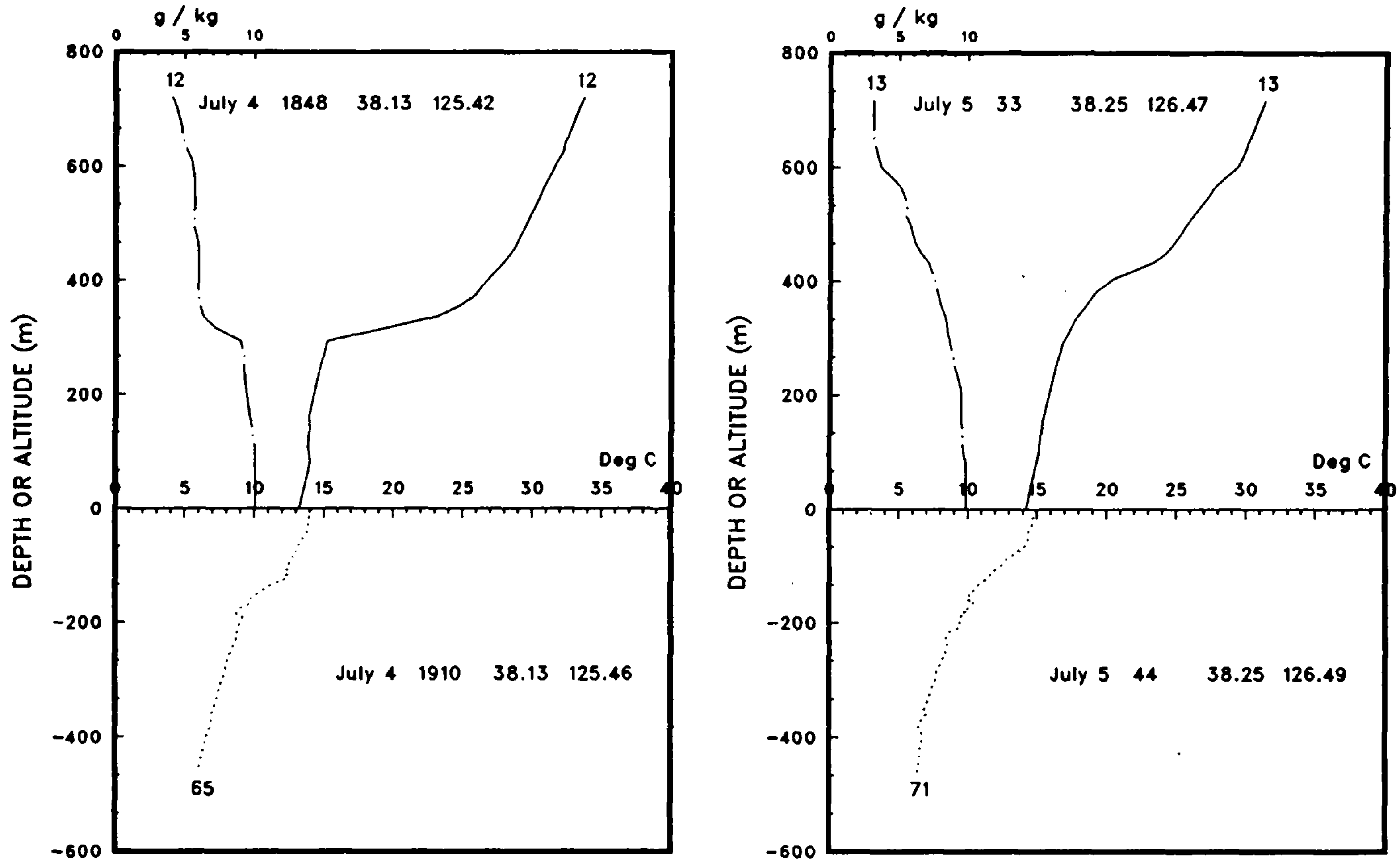

g / kg
Deg C
DEPTH OR ALTITUDE (m)
July 4 1848 38.13 125.42
July 4 1910 38.13 125.46
12
12
65
g / kg
Deg C
DEPTH OR ALTITUDE (m)
July 5 33 38.25 126.47
July 5 44 38.25 126.49
13
13
71

Figure 8(f).

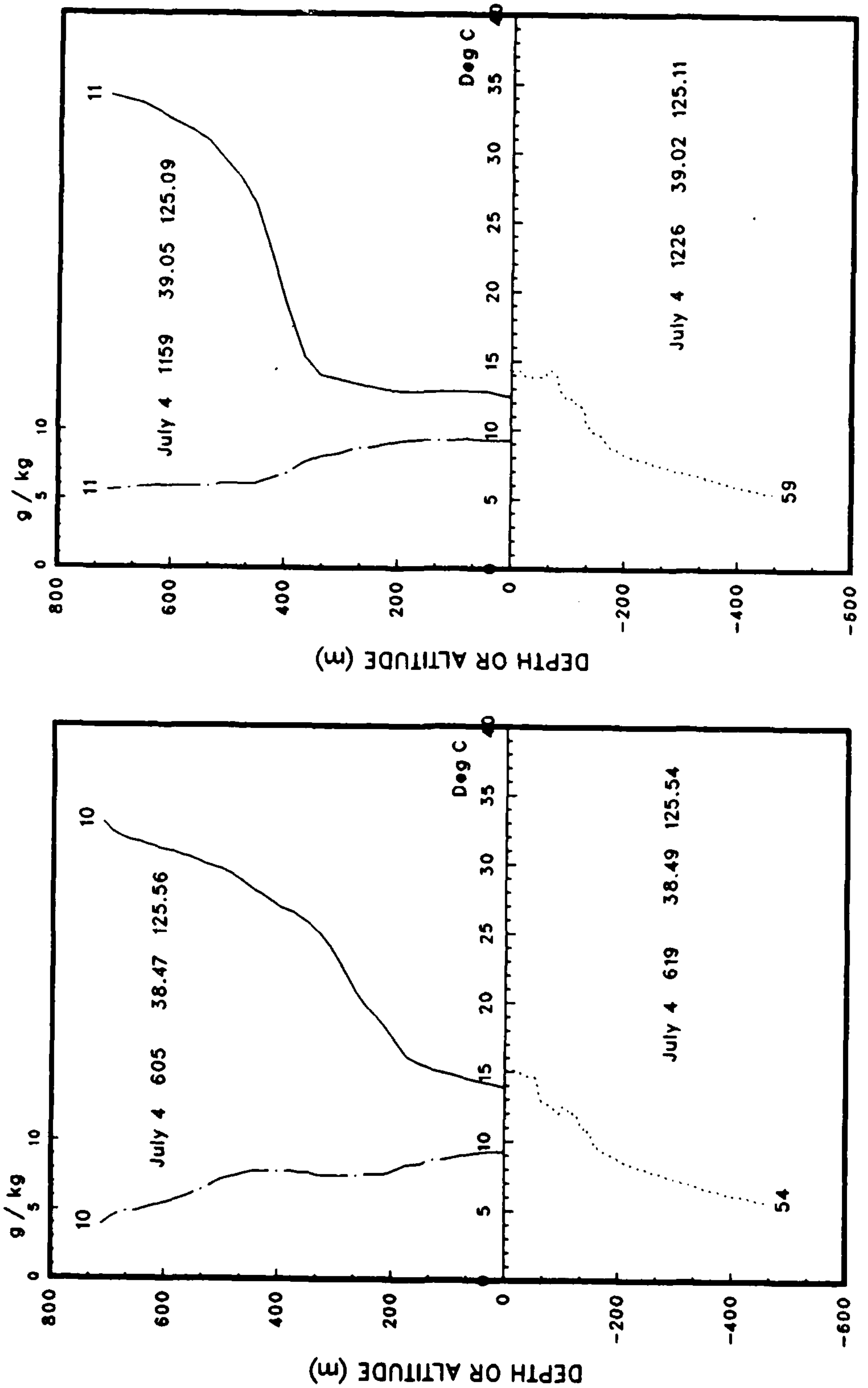
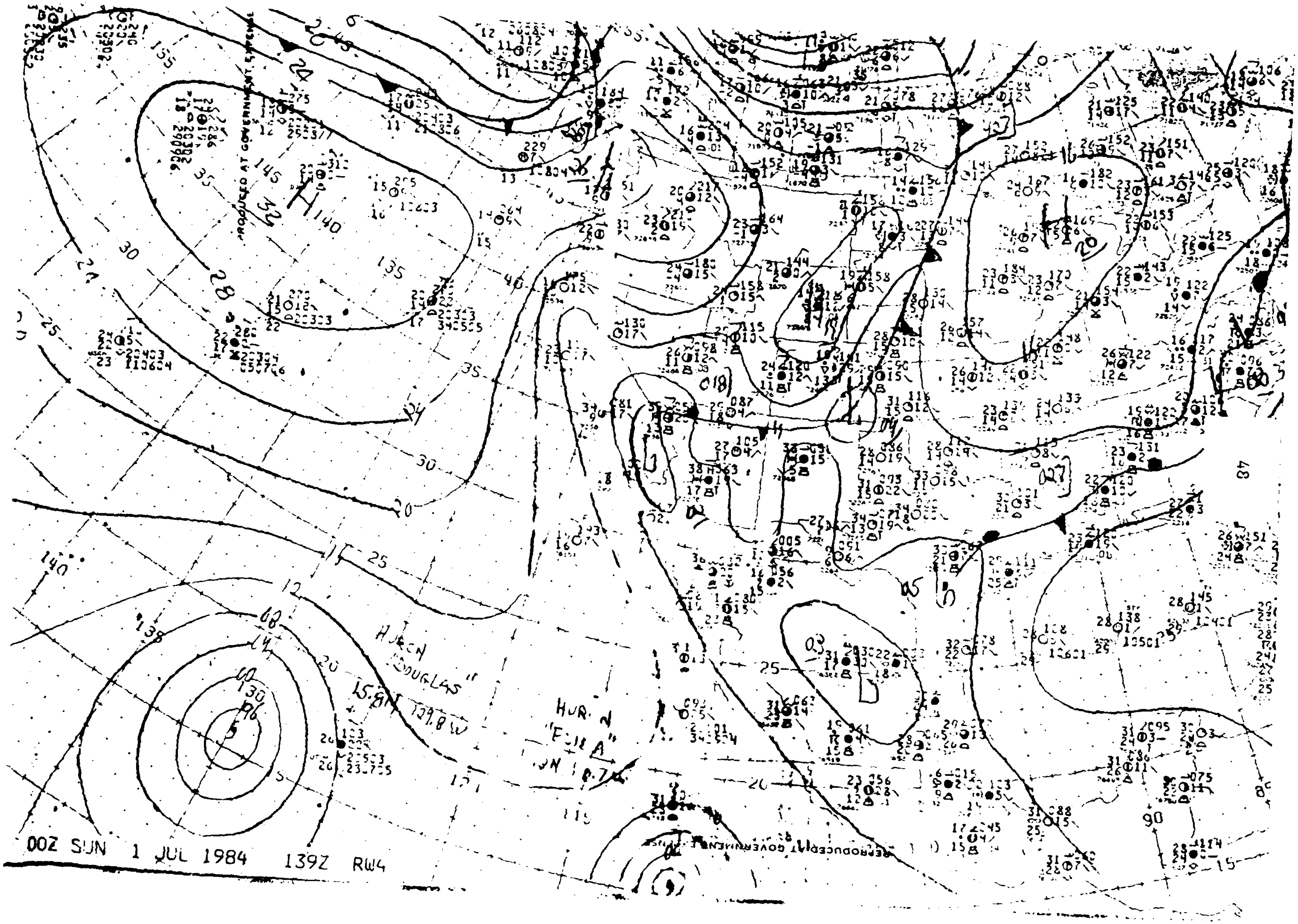
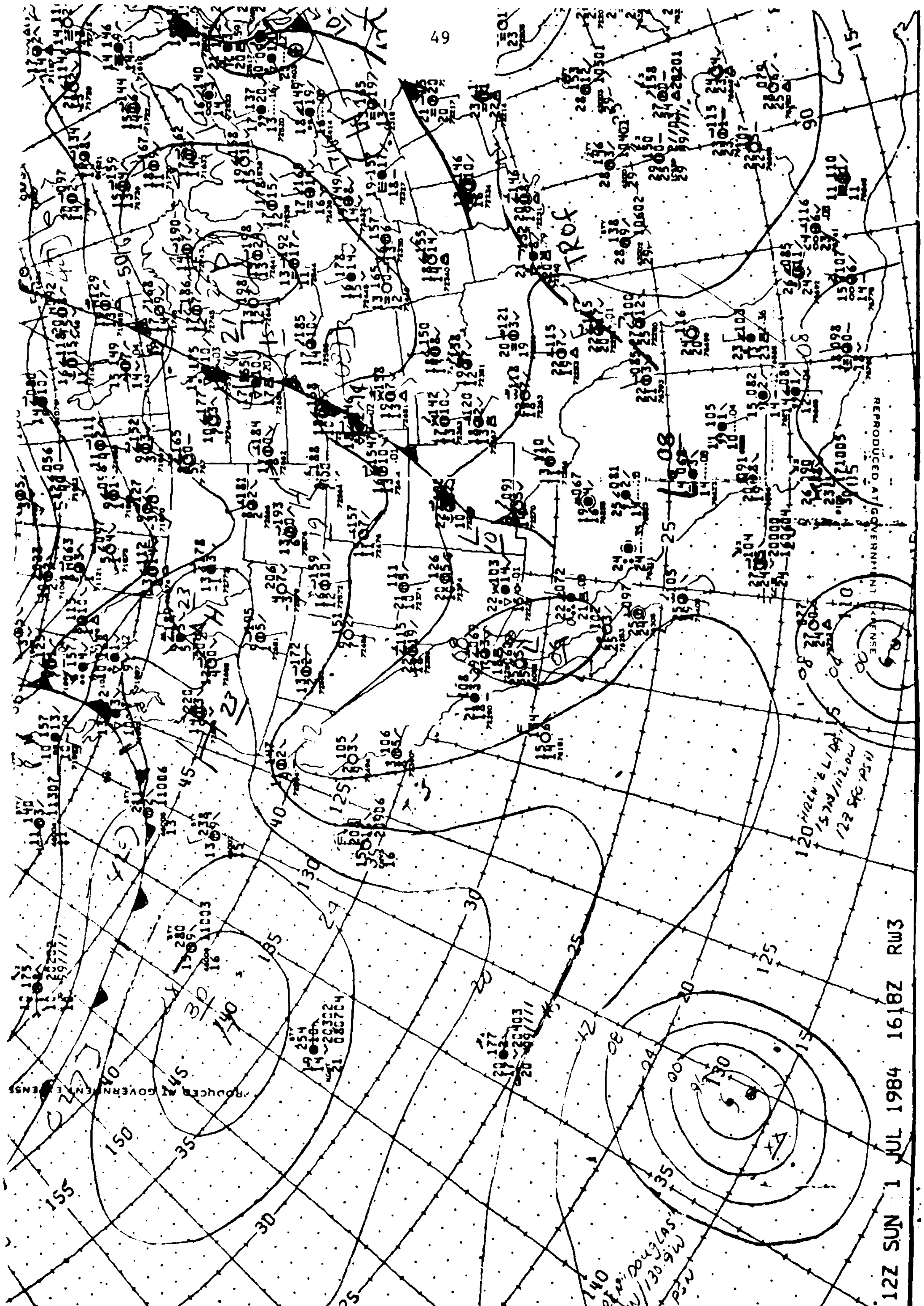
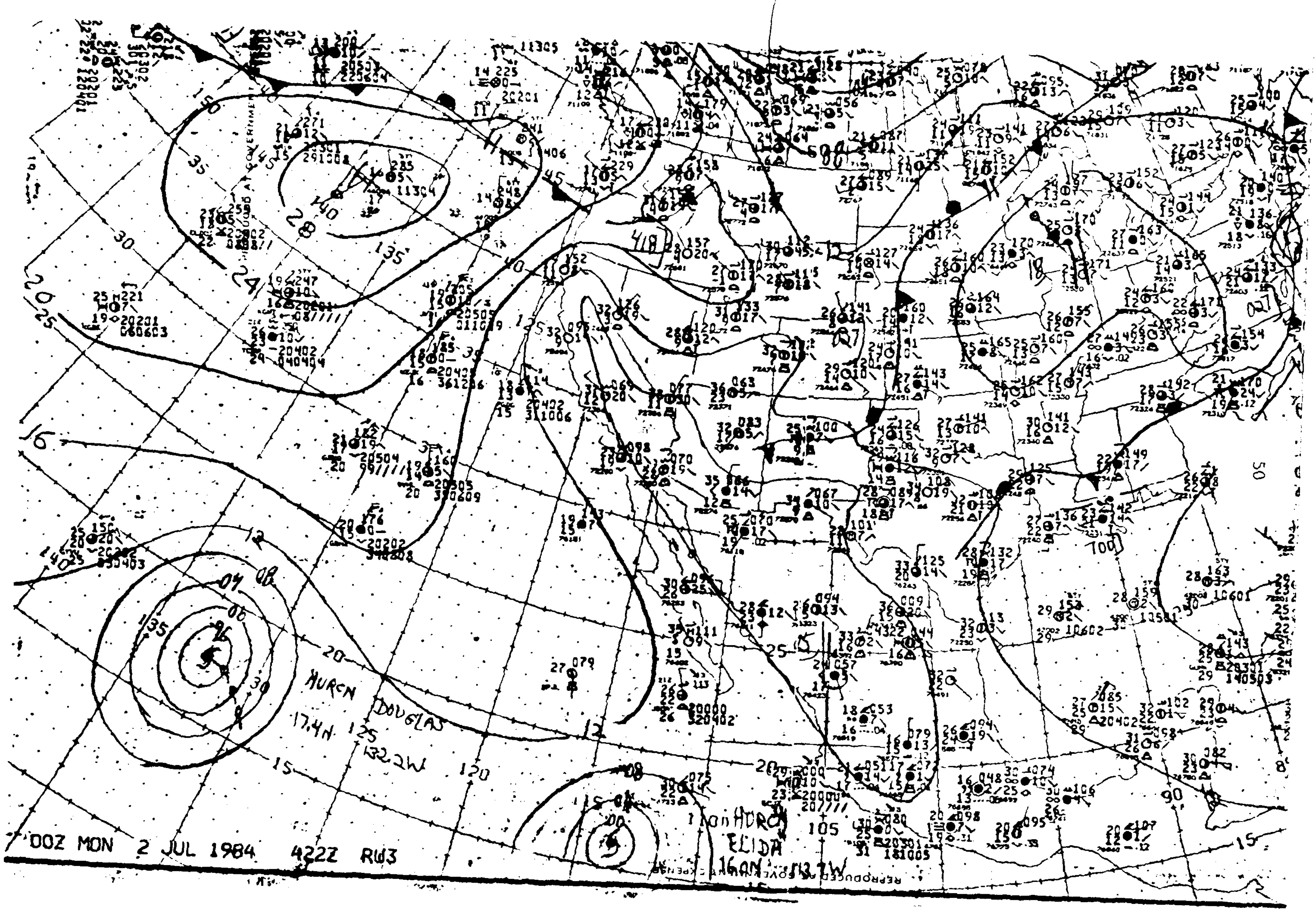

July 4 1159 39.05 125.09
July 4 1226 39.02 125.11
Deg C
g / kg
DEPTH OR ALTITUDE (m)
July 4 605 38.47 125.56
July 4 619 38.49 125.54
Deg C
g / kg
DEPTH OR ALTITUDE (m)

Figure 8(e).

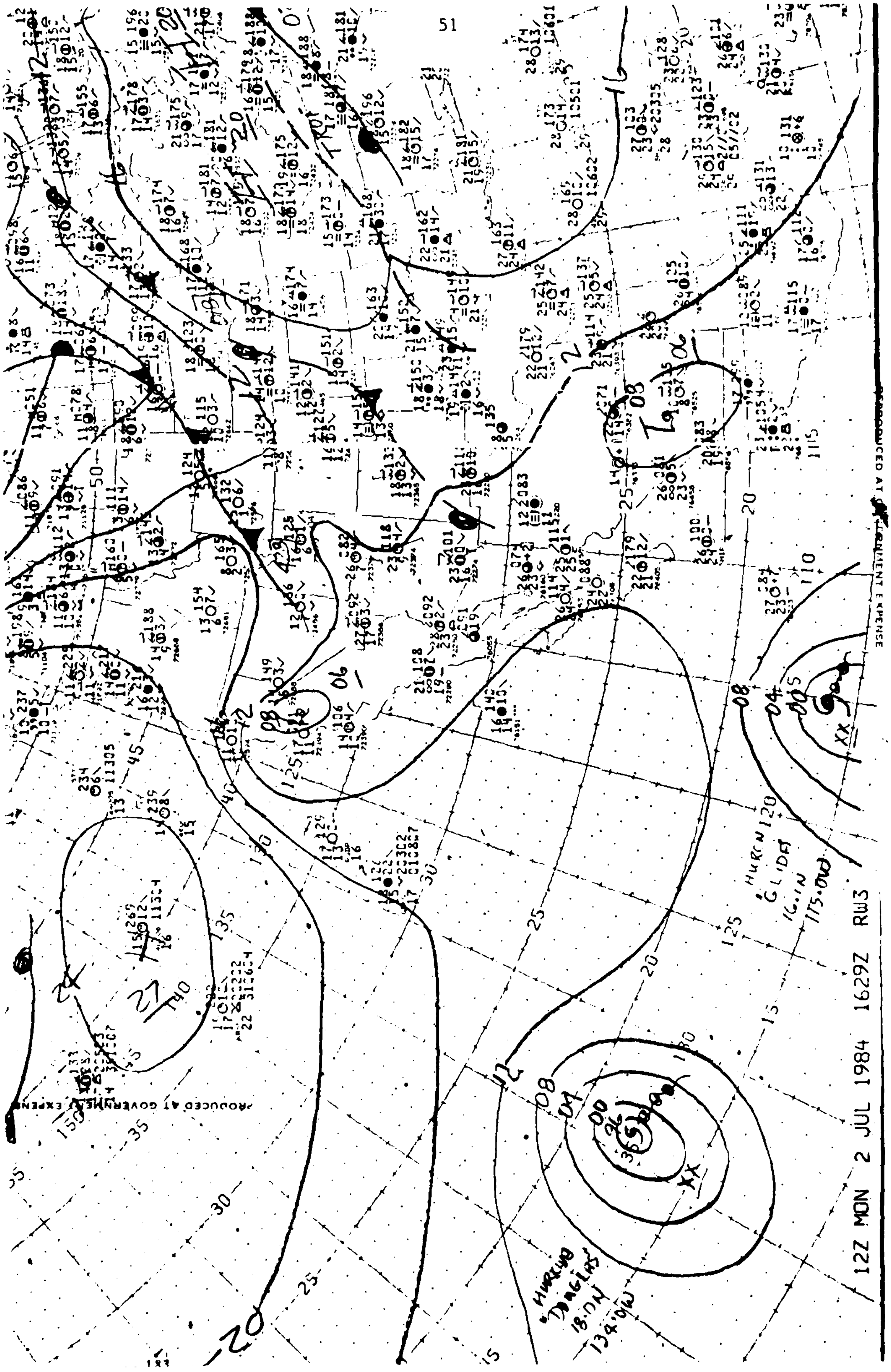

48
REPRODUCED AT GOVERNMENT EXPENSE
00Z SUN 1 JUL 1984 139Z RW4


12Z SUN 1 JUL 1984 161BZ RW3
REPRODUCED AT GOVERNMENT EXPENSE
TROF



00Z MON 2 JUL 1984 422Z RW3
HURCN DOUGLAS
17.4N 132.2W
HURCN ELIDA
16.0N 113.7W

50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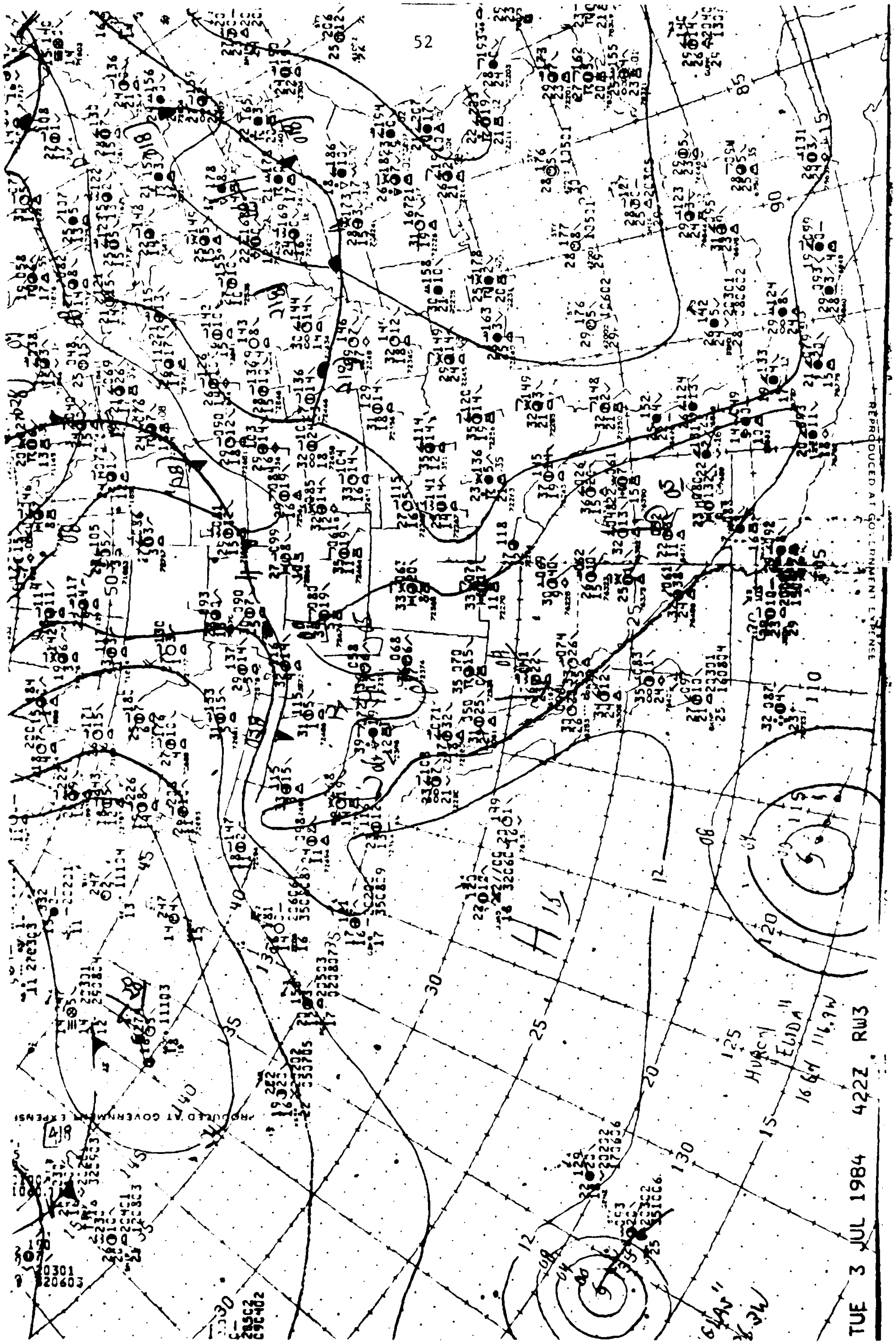
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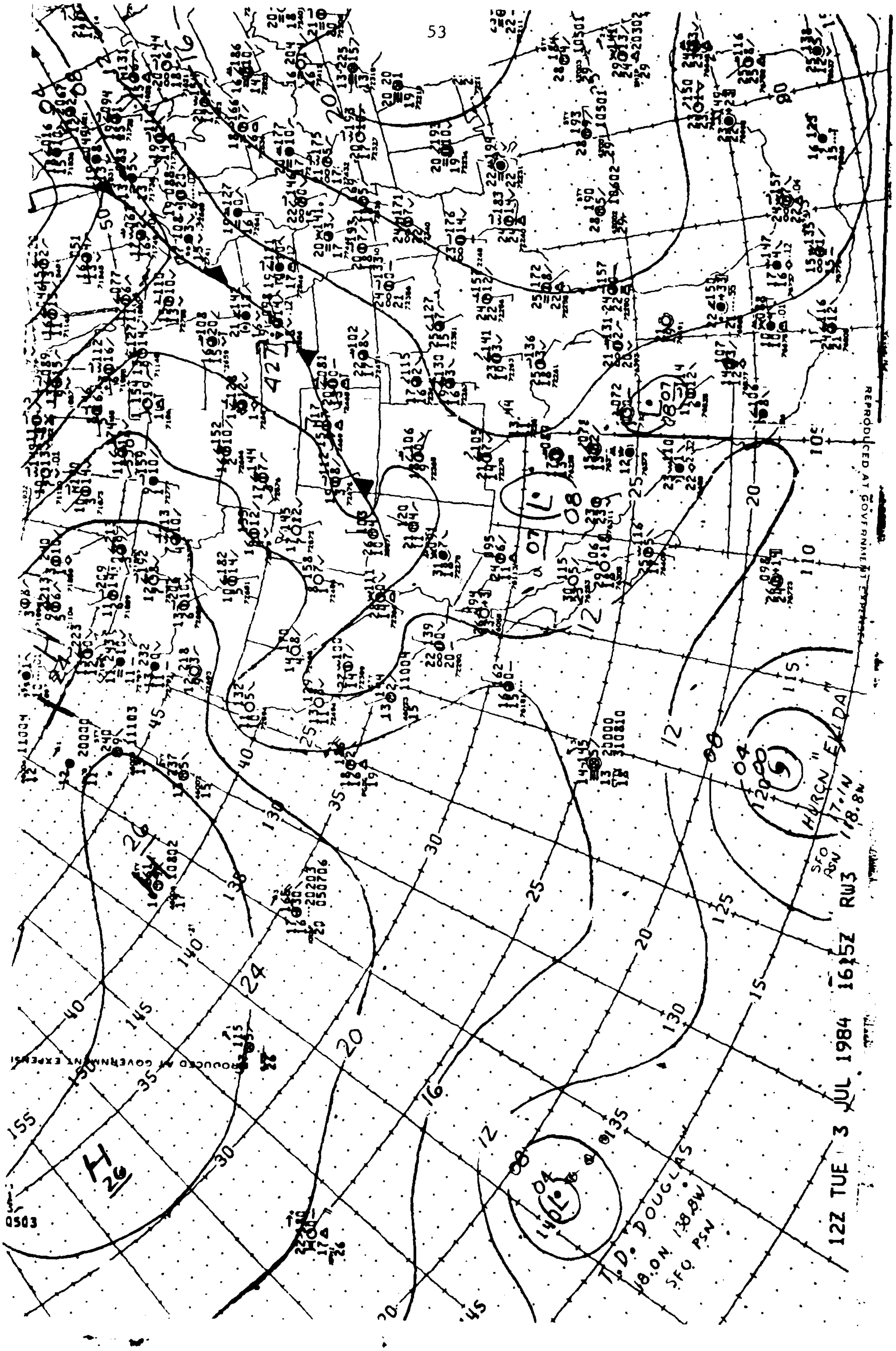
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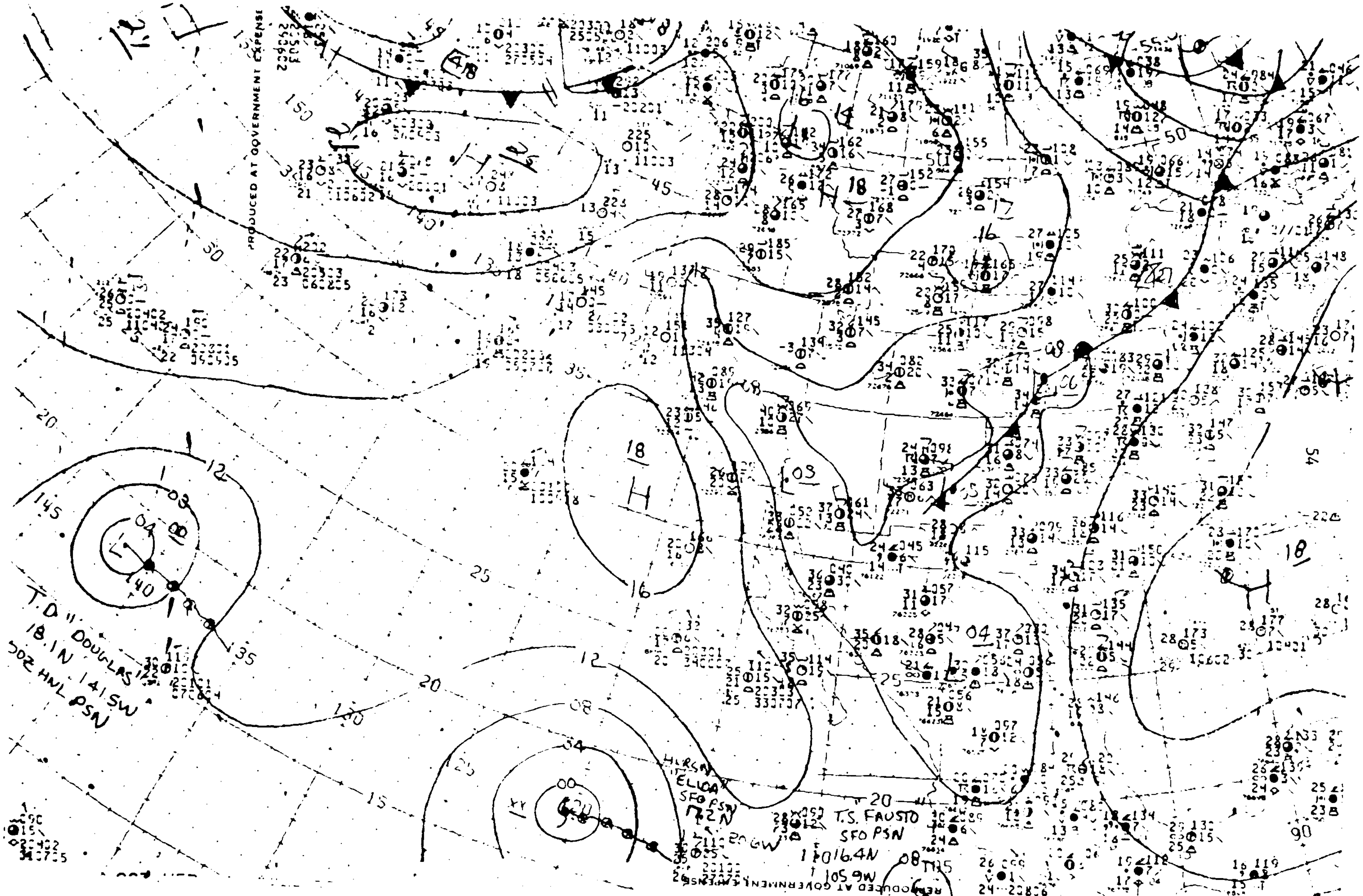

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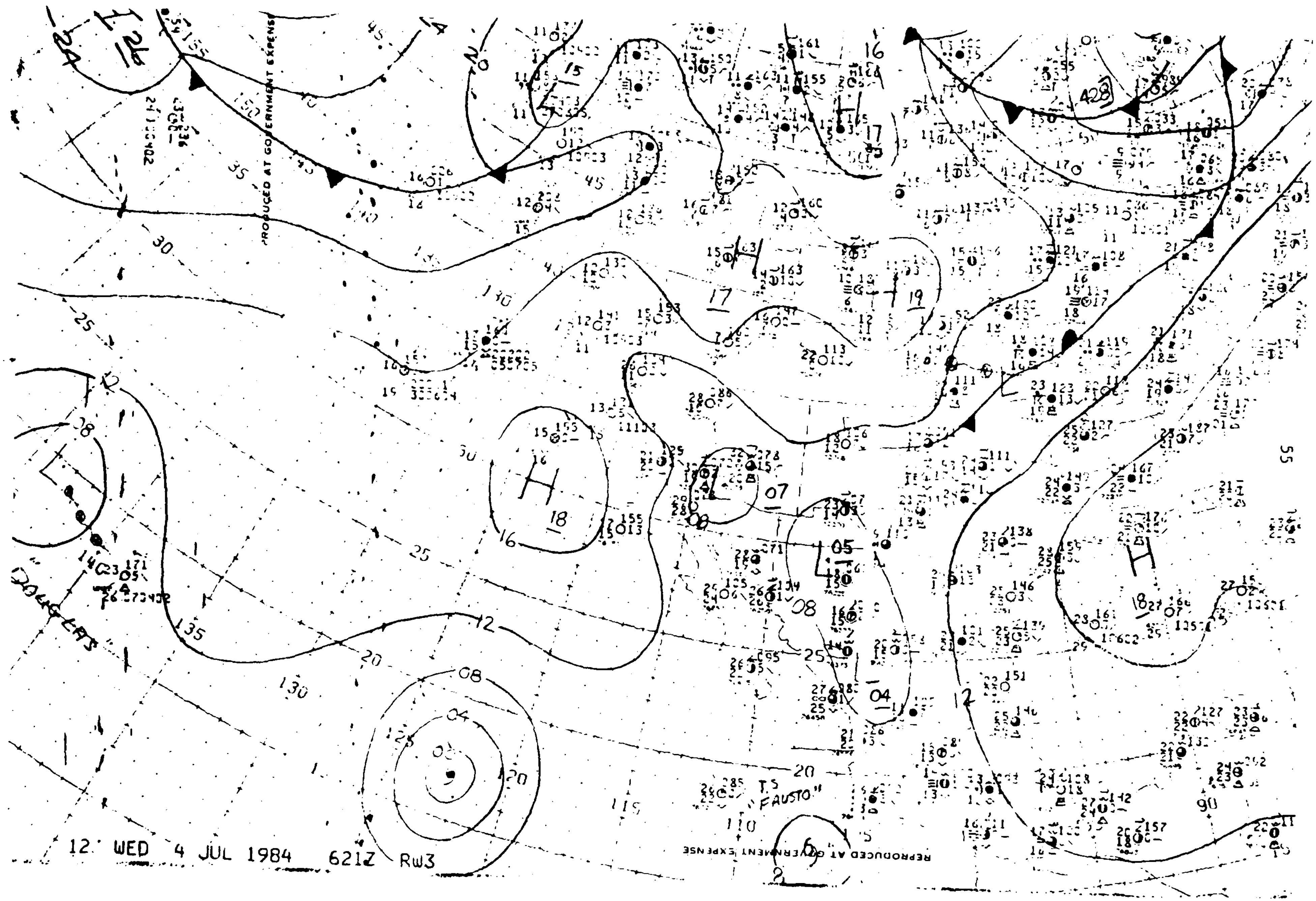
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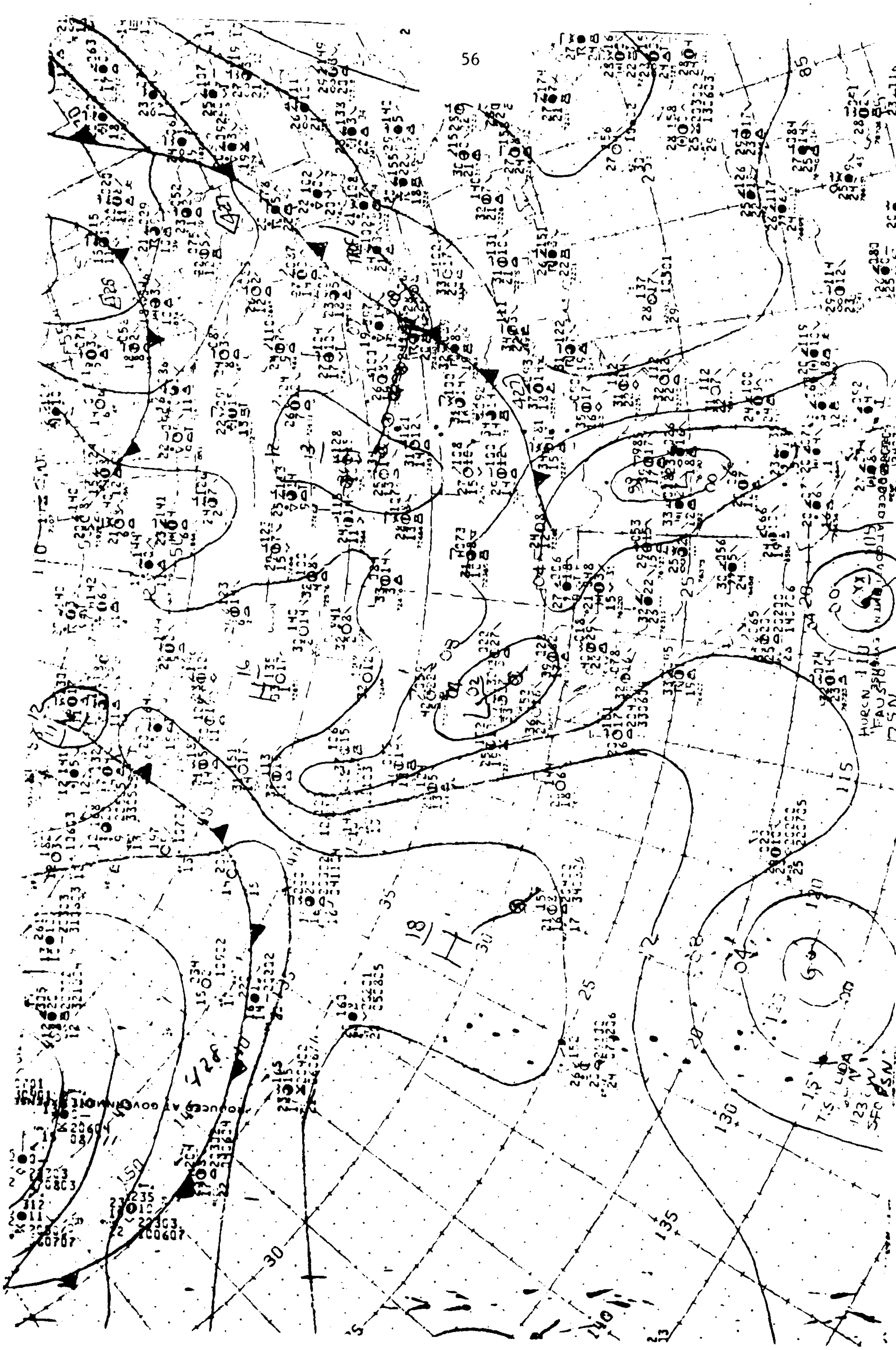

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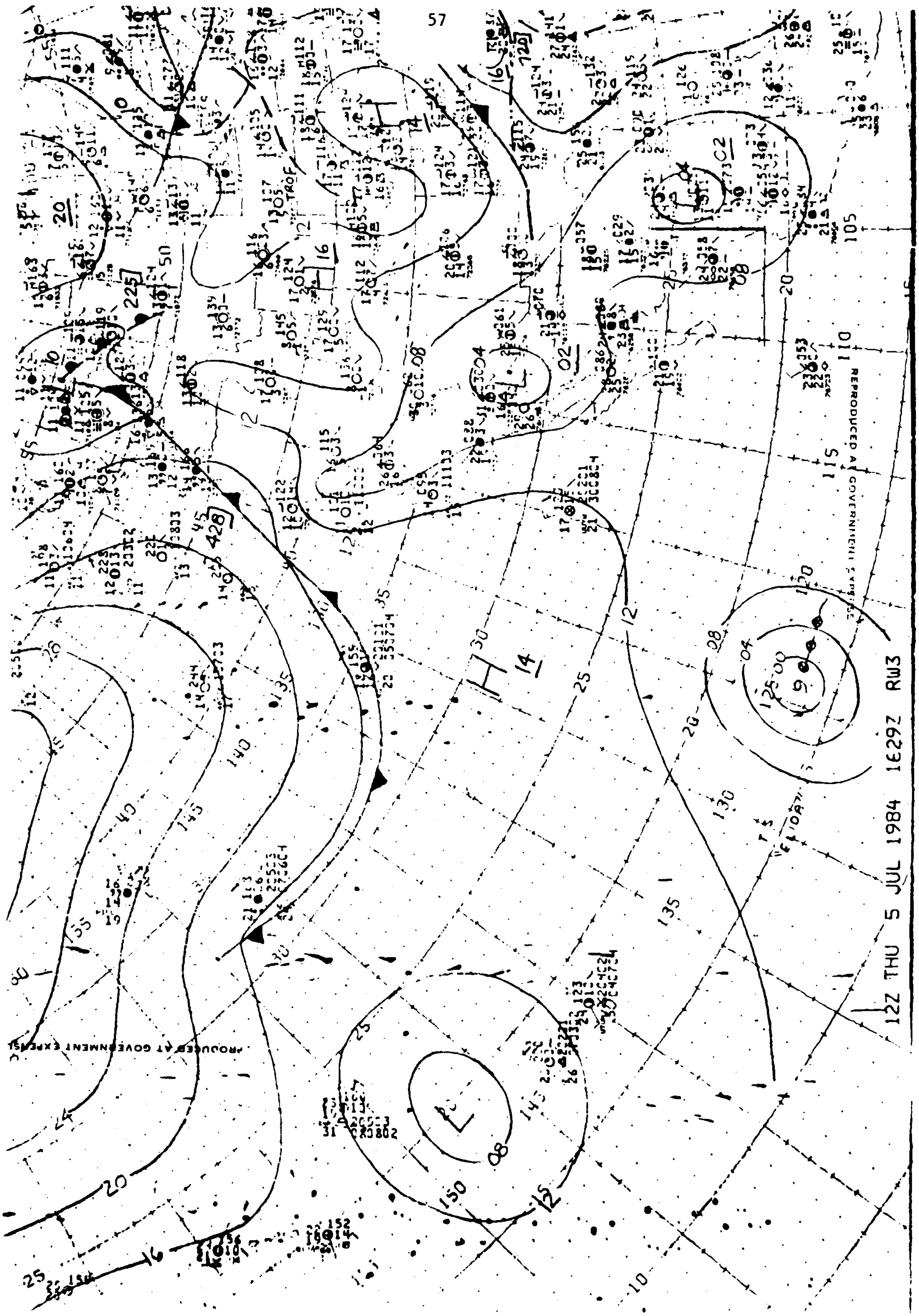
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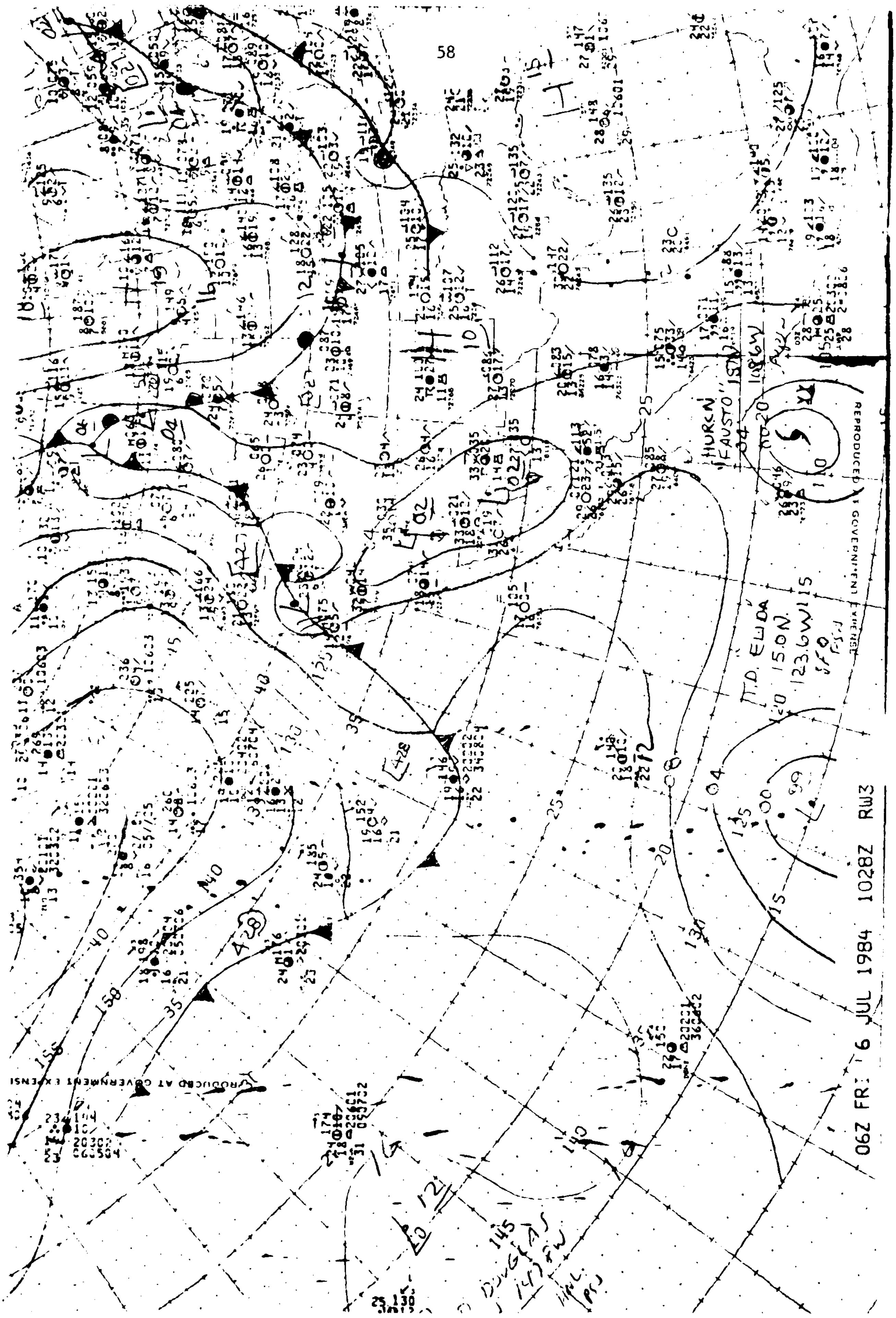
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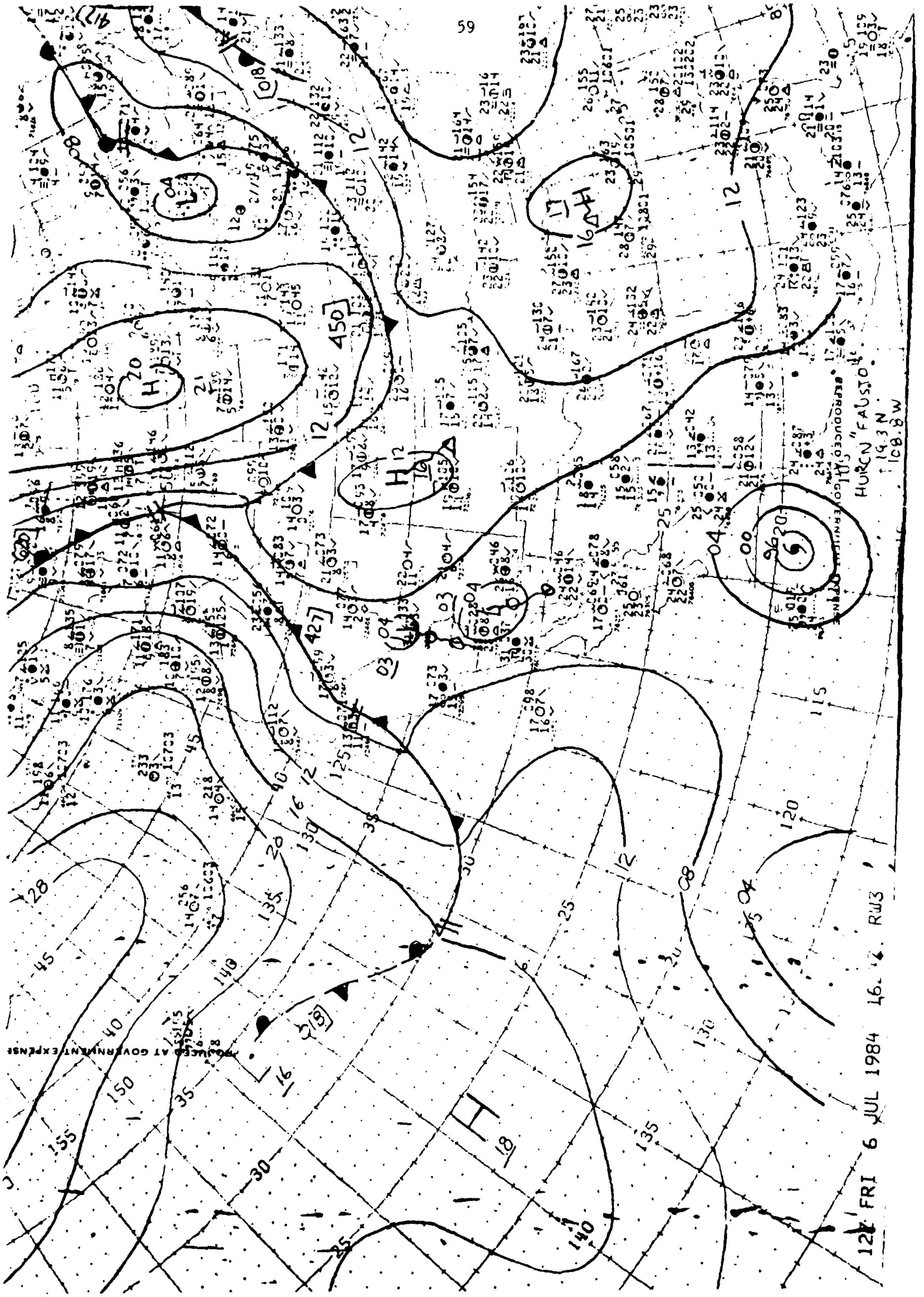
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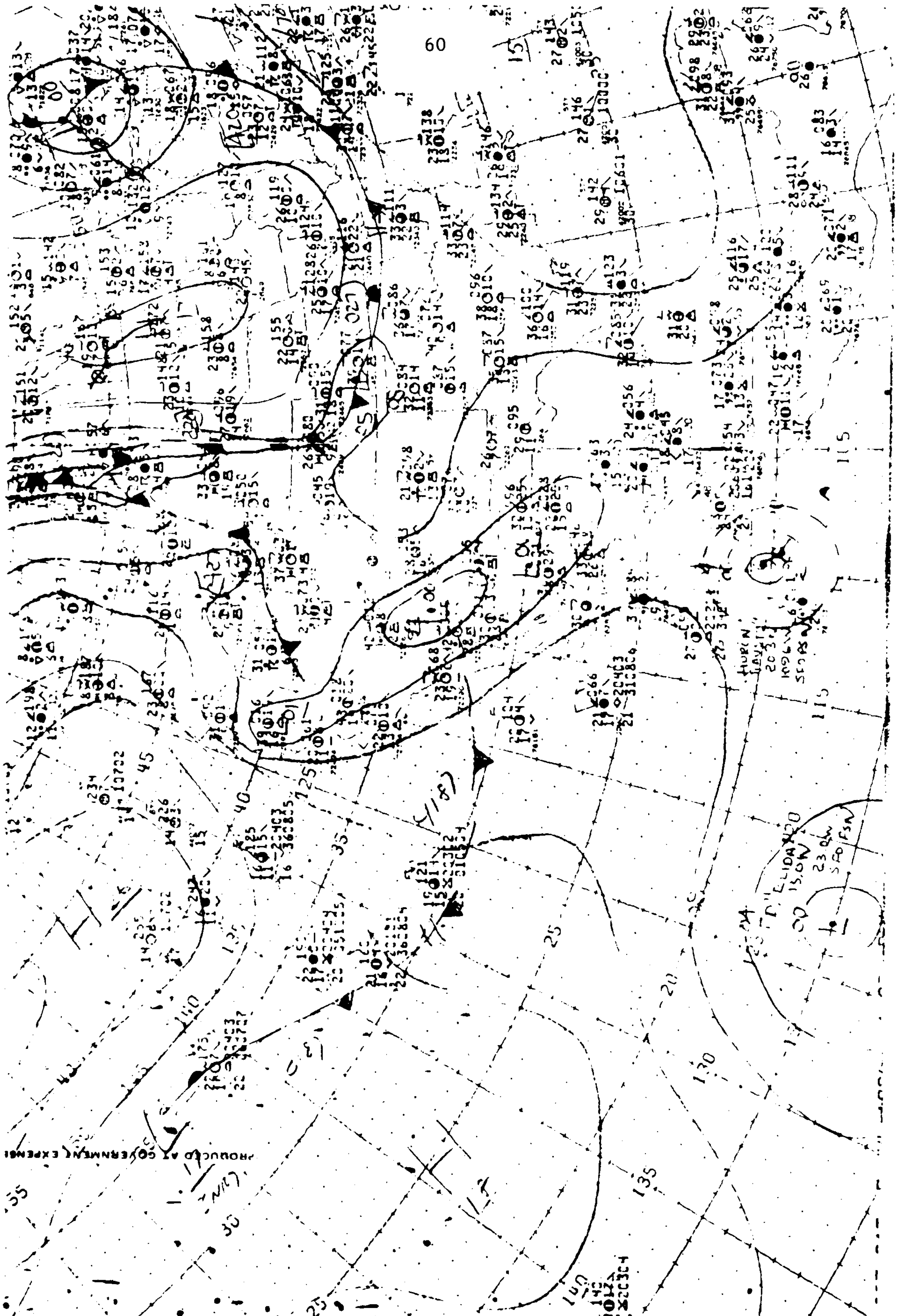

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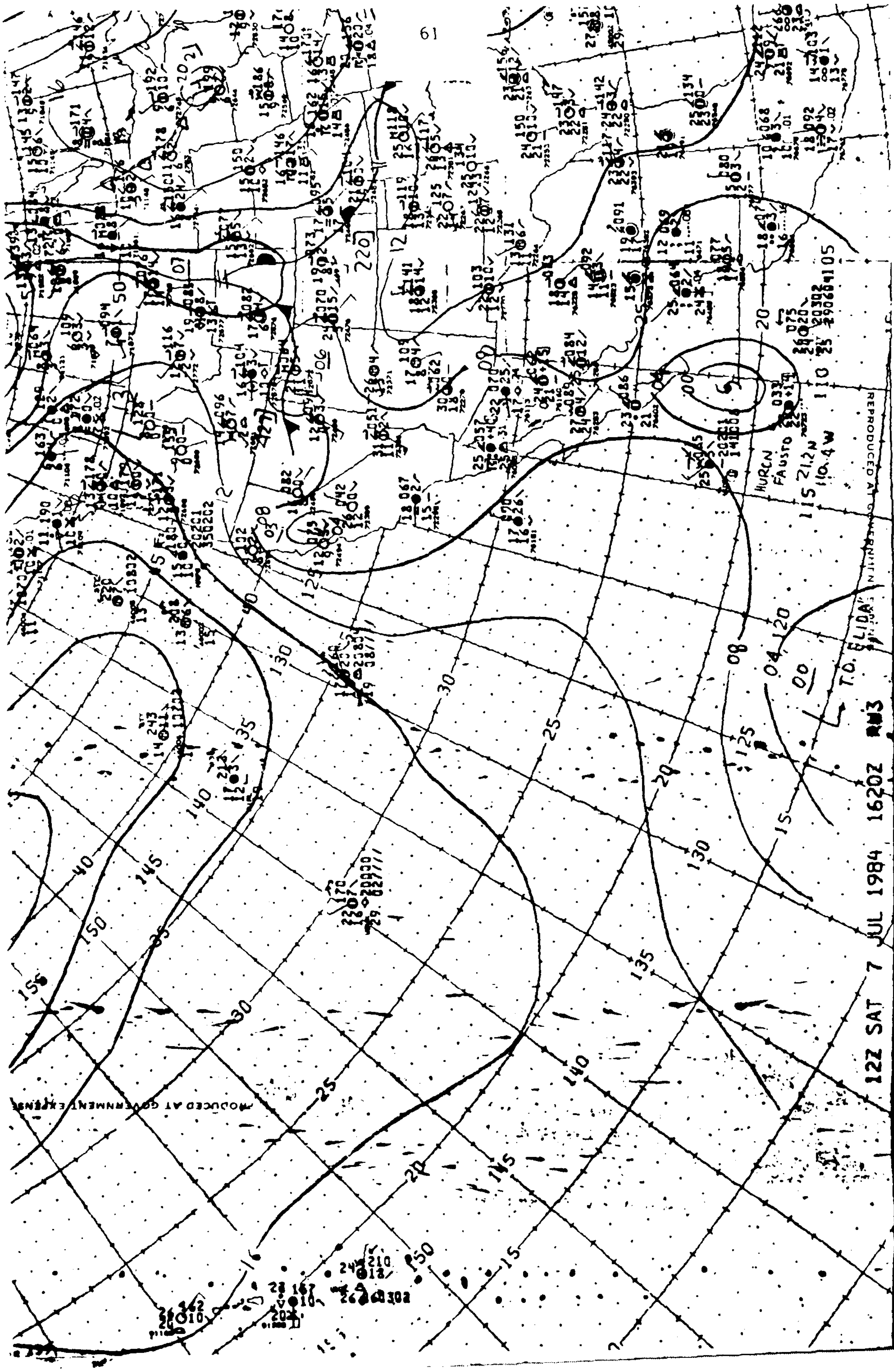
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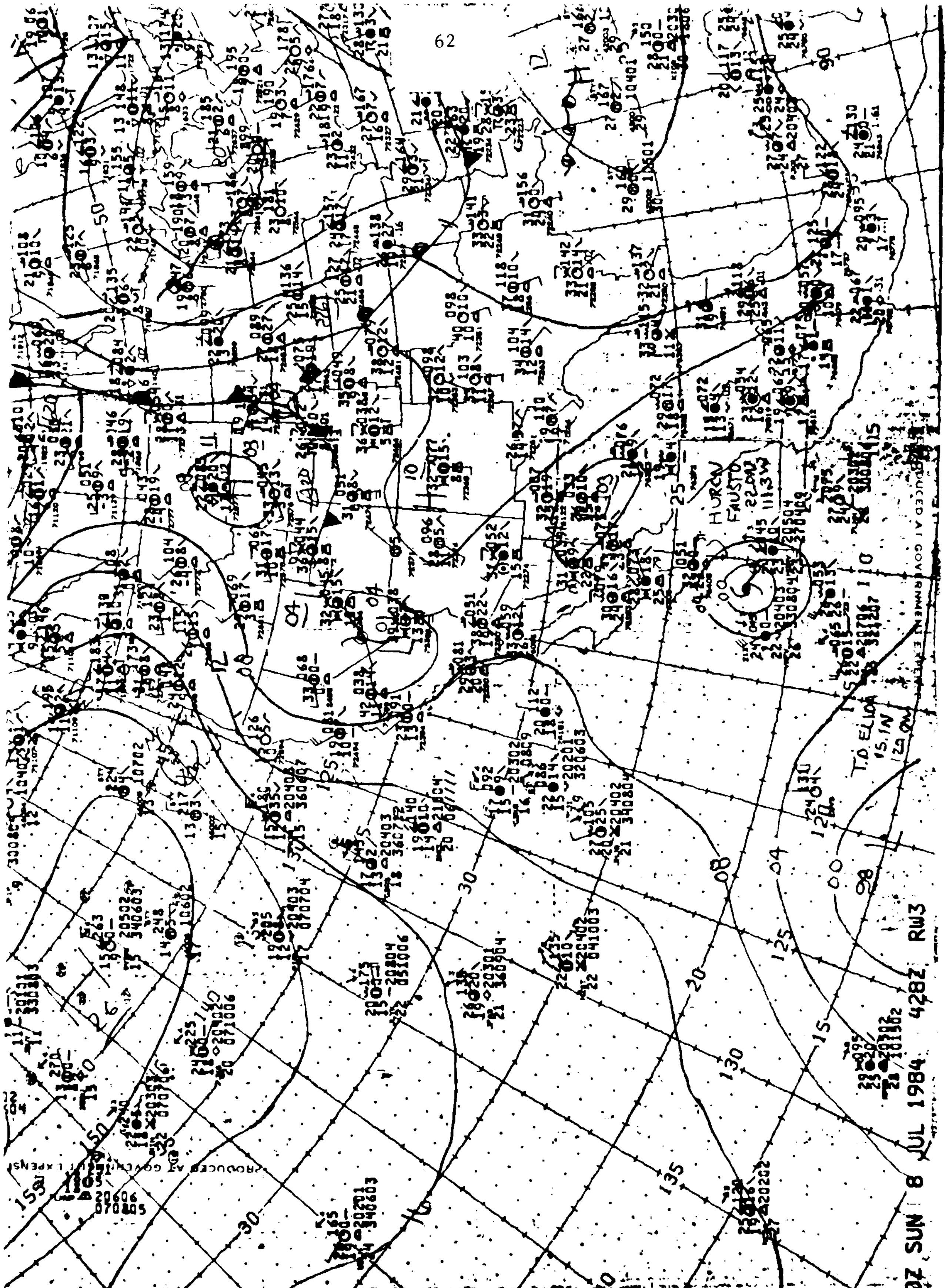
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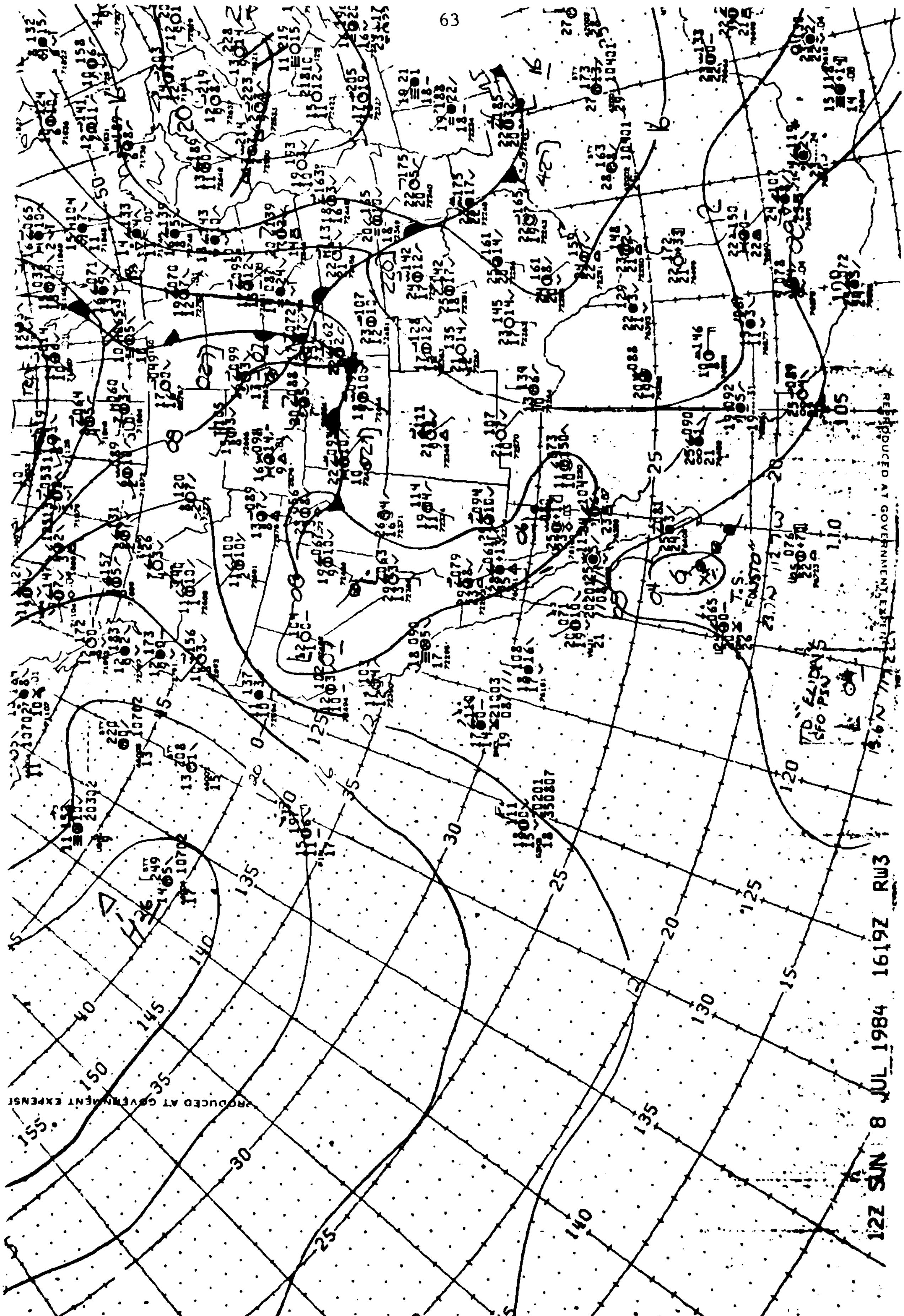
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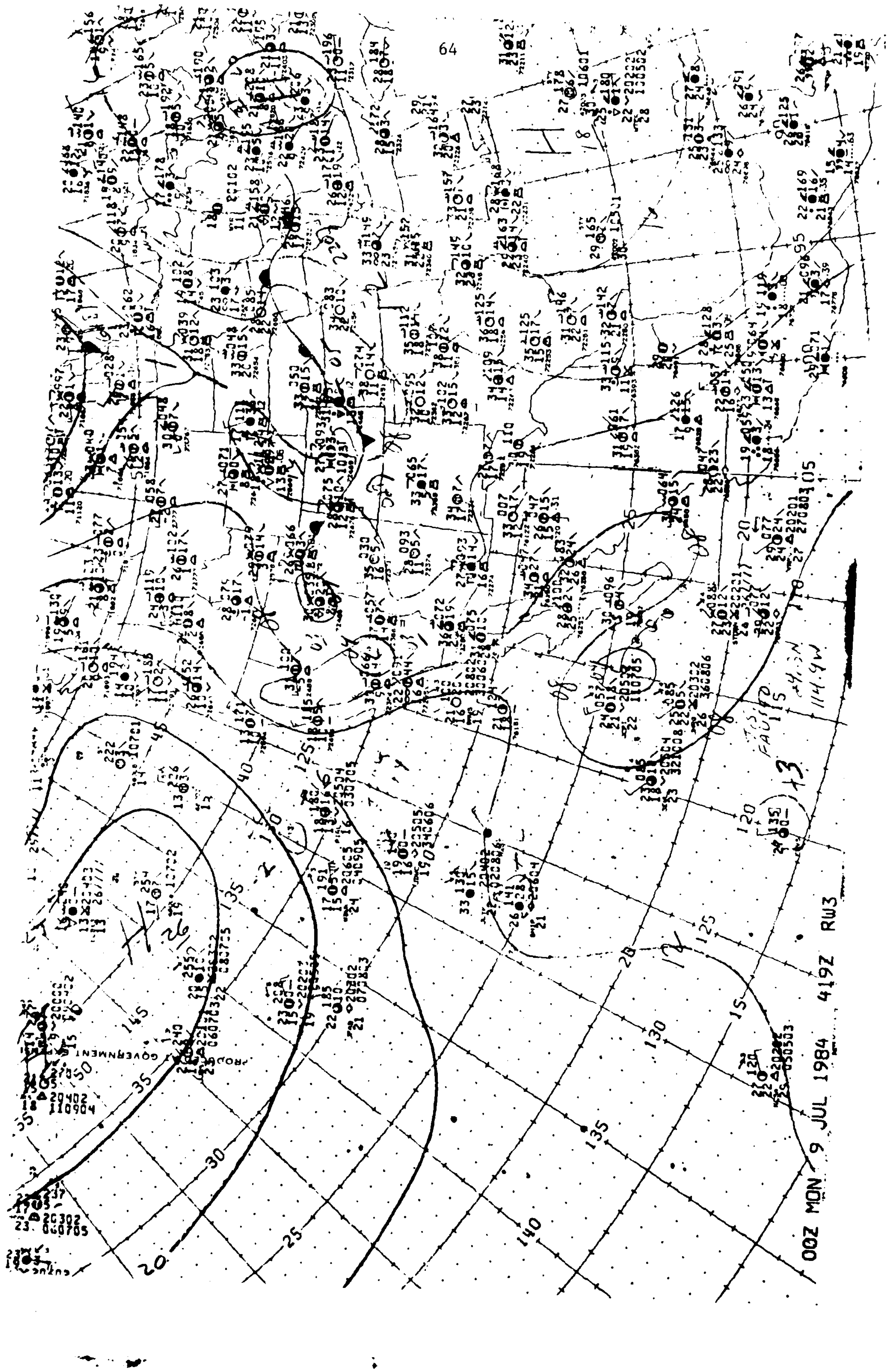
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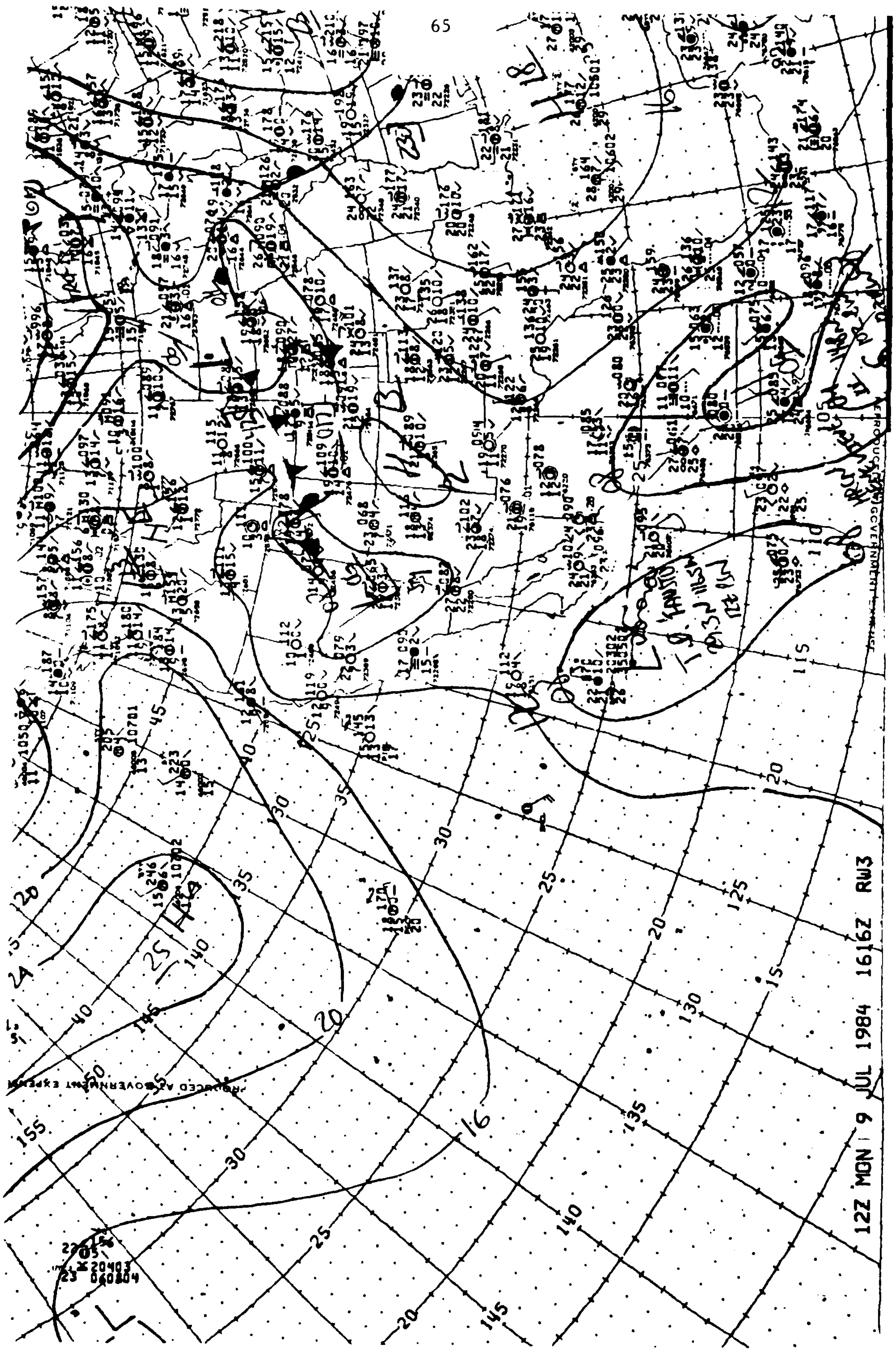
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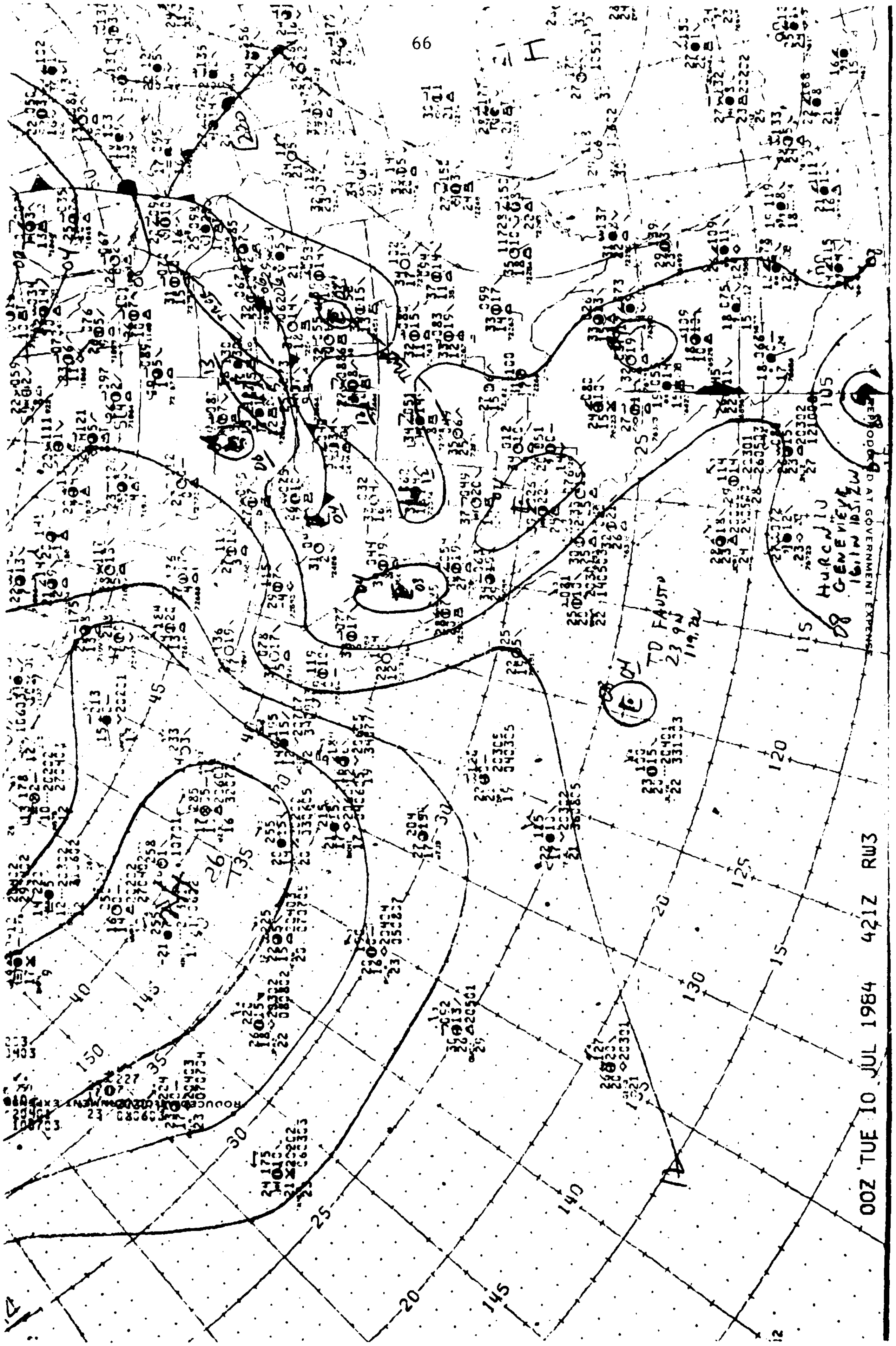
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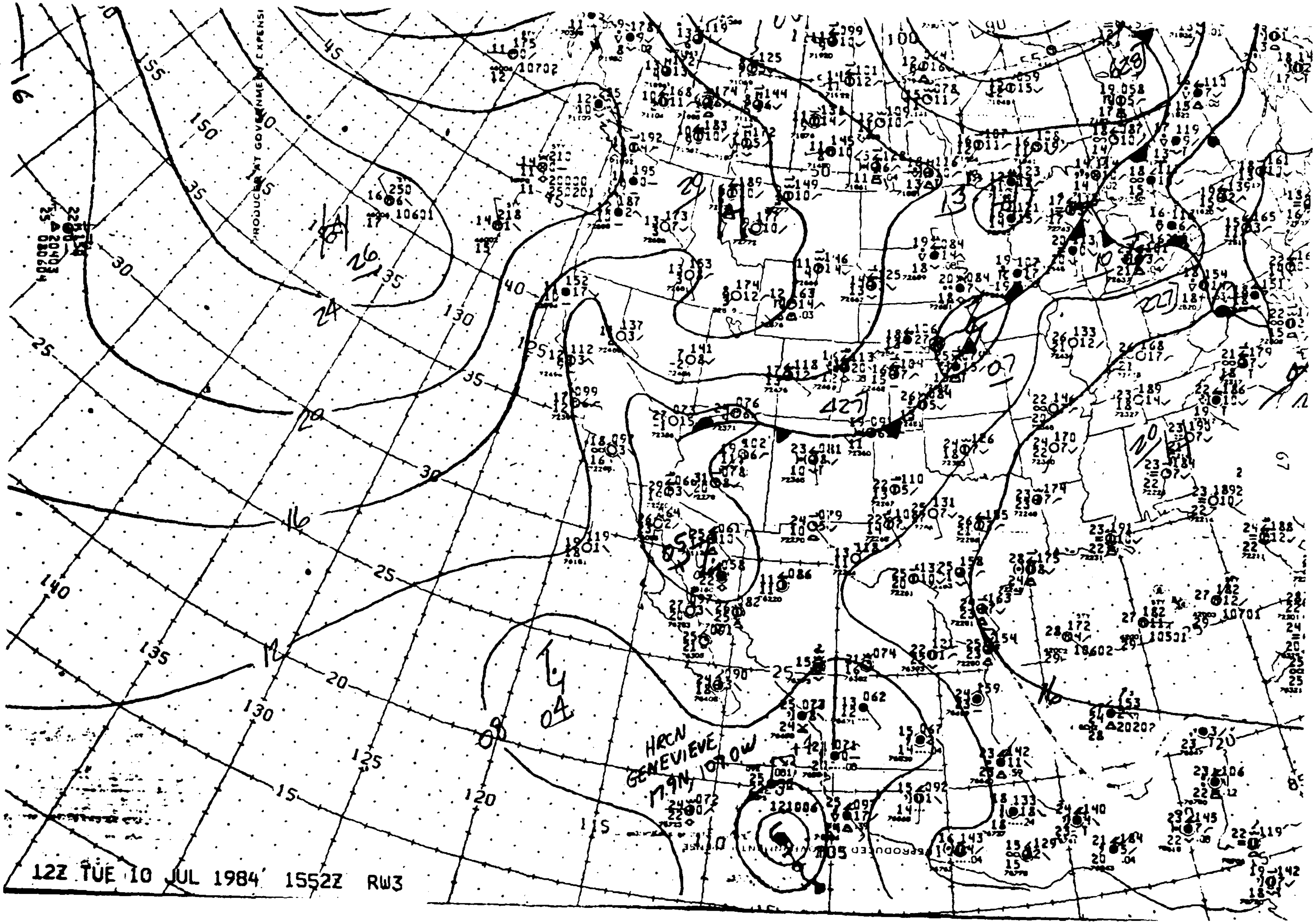
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